

## 19.

Eastern Pacific Expeditions of the New York Zoological Society. XLI.  
Mollusks from the West Coast of Mexico and Central America. Part VIII.<sup>1</sup>

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(Plate I).

[This is the forty-first of a series of papers dealing with the collections of the Eastern Pacific Expeditions of the New York Zoological Society made under the direction of William Beebe. The present paper is concerned with specimens taken on the Templeton Crocker Expedition (1936) and the Eastern Pacific Zaca Expedition (1937-1938). For data on localities, dates, dredges, etc., refer to *Zoologica*, Vol. XXII, No. 2, pp. 33-46, and Vol. XXIII, No. 14, pp. 287-298.]

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## INTRODUCTION

This is the eighth of a series of papers dealing with collections of mollusks taken on the Templeton Crocker Expedition (1936) and the Eastern Pacific Zaca Expedition (1937-1938). The general plan of presentation followed in the present con-

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<sup>2</sup> Hertlein, L. G., and Strong, A. M. Eastern Pacific Expeditions of the New York Zoological Society. XXIII. Mollusks from the West Coast of Mexico and Central America. Part II. *Zoologica*, New York Zool. Soc., Vol. 28, Pt. 3, December 6, 1943, pp. 149-168, 1 pl. See especially pp. 149-150.

tribution is that mentioned in Part II of this series of papers<sup>2</sup>. Formal headings and keys are given for the species collected by the expeditions of 1936 and 1937-1938. Occasionally additional species are included in the keys for convenience but in such cases it is indicated which species do not occur in the present collection.

Acknowledgment is due Dr. G. D. Hanna, Curator, Department of Paleontology of the California Academy of Sciences, Mr. A. G. Smith, Research Associate of the same institution, and Dr. A. Myra Keen, Stanford University, California, for assistance and suggestions. The photographs used for illustrations on the plate were prepared by Mr. Frank L. Rogers.

## FAMILY SEMELIDAE.

A paper by Dall<sup>3</sup> dealing with the west American Semelidae and one by Lamy<sup>4</sup> which contains a revision of the species of this group in the Natural History Museum in Paris are useful to anyone studying the Recent west American forms of this family.

## KEY TO THE GENERA OF THE SEMELIDAE.

- A. Pallial sinus free from the pallial line  
    *Semele*
- B. Pallial sinus confluent with the pallial line  
    a. Length exceeding 10 mm.; moderately thick.....*Cumingia*  
    aa. Length rarely exceeding 10 mm.; very thin; usually smooth.....*Abra*

Genus *Semele* Schumacher.KEY TO THE SPECIES OF *Semele*.

- A. Concentrically sculptured with coarsely corrugated or wrinkle-ribbed ridges  
    a. Exterior with radial striae or wrinkled and granulated sculpture  
    b. Interior white; dorsal margin purple; truncated posteriorly  
    *decisa*

<sup>3</sup> Dall, W. H. Notes on the Semelidae of the West Coast of America, including some new species. *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 67, issued March 2, 1915, pp. 25-28.

<sup>4</sup> Lamy, E. Révision des Scrobiculariidae vivants du Muséum d'Histoire Naturelle de Paris. *Journ. de Conchyl.*, Vol. 61, No. 3, March 25, 1914, p. 243-368, pl. 8, also figs. in text.

- bb. Interior brown, orange or yellow  
 c. Interior brown; corrugated  
*tabogensis*  
 cc. Interior yellow or orange;  
 wrinkle-ribbed exteriorly  
*californica*  
 aa. Exterior without radial sculpture  
*craneana*
- B. Concentrically sculptured with raised threads, lamellae, or growth lines only  
 a. Concentric sculpture of growth lines only  
 b. Diagonal striae present  
*sparsilineata*  
 bb. Diagonal striae absent; smooth, pure white.....*laevis*  
 aa. Concentric sculpture of raised threads or lamellae  
 c. Escutcheon wide, strongly beveled .....*flavescens*  
 cc. Escutcheon very narrow or lacking  
 d. Shell without radial sculpture; white  
 e. Interspaces with fine concentric striae  
*paziana*<sup>5</sup>  
 ee. Interspaces without fine concentric striae  
*simplicissima*  
 dd. Shell with radial sculpture  
 f. Shell with incised radial grooves on part or all of valves  
 g. Incised sculpture along anterior dorsal margin only  
 h. Concentric ribs closely spaced, fine  
 i. Shell thick, fairly high; interior with a deep purple blotch *pulchra*  
 ii. Shell thinner, more elongate; less purple coloration  
*quentinensis*  
 hh. Concentric ribs more widely spaced, coarse  
*guaymasensis*  
 gg. Incised sculpture present along anterior and posterior margins  
 j. Concentric ribbing fine  
*jaramija*  
 jj. Concentric ribbing coarse;
- entire valve often reticulatedly sculptured *pacifica*  
 ff. Shell without incised radial grooves; fine radial striae present, stronger in interspaces  
 k. Shell suborbicular or roundly ovate  
 l. brownish - red with white medial streak on umbos; large  
*jovis*  
 ll. Yellowish or white  
*mediamericana*<sup>5</sup>  
 kk. Shell elongate  
 m. Concentric lamellae high; shell large; white with purple spots  
 n. Lamellae with scalloped scale-like projections  
*verrucosa*  
 nn. Lamellae without scale-like projections; more rounded ventrally  
*formosa*<sup>5</sup>  
 mm. Concentric lamellae low; shell small; umbos purplish or brownish  
 o. Thick; end of pallial sinus slightly attenuated  
*venusta*  
 oo. Thin; end of pallial sinus blunt  
*incongrua*<sup>5</sup>

***Semele corrugata californica* Reeve.**

*Amphidesma californica* Reeve, Conch. Icon., Vol. 8, *Amphidesma*, October, 1853, species 19, pl. 3, fig. 19. "Gulf of California."

<sup>5</sup> Not represented in the present collection.

*Semele californica* A. Adams, *Proc. Zool. Soc. London* for 1853 (issued July 25, 1854), p. 96. "Hab. Gulf of California. Mus. Cuming."

*Type Locality*: Gulf of California.

*Range*: Magdalena Bay, Lower California, to the Gulf of California.

*Collecting Station*: Mexico: Cape San Lucas, Lower California, beach.

*Description*: Shell ovately oblong, sub-equilateral, dirty pale brown, radiately striated; transversely sulcated, ribs elevated, subcorrugated, ornamented, interspaces closely longitudinally striated; anterior side rounded, posterior subtruncated, very flexuous; interior yellowish, margin yellow. (Free translation of Adams' original description.)

The shell of this subspecies is characterized by the concentric wrinkle-ridged ribs and the dense minute radial striae. A small lunule is present but no appreciable escutcheon. Exteriorly the shells are usually yellowish or yellowish-white in color. The umbos are often yellow and on some specimens a few faint brown transverse markings are present on the dorsal margin both anterior to and posterior to the beaks. Interiorly the shells are usually yellow, sometimes a beautiful golden or orange-yellow. The pallial sinus ascends gently and is rounded at the end which extends forward a little over one-half the length of the shell.

A left valve from Cape San Lucas, in the present collection, measures: length, 40.2 mm.; height, 36 mm.; convexity (one valve), 7.3 mm. A specimen from Magdalena Bay, Lower California, in the Henry Hemphill Collection of the California Academy of Sciences measures: length, 37.5 mm.; height, 33.6 mm.; convexity (both valves together), 15.2 mm.; pallial sinus extends anteriorly 22 mm. from the posterior margin of the shell.

This form apparently is, as stated by Dall, closely related to *Semele corrugata* Sowerby<sup>6</sup>. The specimens which we have seen from Magdalena Bay and the Gulf of California appear to be a little smaller than those of *S. corrugata* Sowerby which was described from Peru. Furthermore these do not have

<sup>6</sup> *Amphidesma corrugatum* Sowerby, *Conch. Illustr.*, Catal. issued with Pt. 19, species No. 8, issued between January 18 and March 8, 1833. [Not illustrated]. "Iquiqui. Peru. Mr. Cuming." Ref. to "Spec. Conch. f. 18." The exact dates of issue of the *Species Conchyliorum* is unknown to us. A copy of Volume 1, Part 2, in the library of the California Academy of Sciences is not dated. In Hanley's edition of Wood's *Index Testaceologicus*, 1856, p. XIX, the dates cited for Sowerby *Species Conchyliorum* are, "part 1. 1830: part II. (imperfect) not published until Nov. 1855" 1. —Sowerby, *Proc. Zool. Soc. London* for 1832, issued March 13, 1833, p. 200. "Hab. in Peruvia et ad Iquiqui." "Dredged from coarse gravel in ten fathoms water."—Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, October, 1853, species 4, pl. 1, fig. 4 (as *Amphidesma corrugata*). [Locality same as in preceding reference].

Shaw (*Proc. Malacol. Soc. London*, Vol. 8, No. 6, 1909, pp. 333-340), in a collation of the Conchological Illustrations, indicated that Parts 17, 18, 19, and the catalogue of species of *Amphidesma* issued with Part 19, appeared between January 18 and March 8, 1833. The species of *Amphidesma* named and illustrated in those parts for the first time take their date of publication from the Conchological Illustrations rather than the *Proceedings* of the Zoological Society of London where the descriptions appeared on March 13, 1833.

the purple coloration on the anterior portion of the hinge as shown on Reeve's illustration of *Semele corrugata*. That species has been recorded as occurring at Magdalena Bay and in the Gulf of California, and it is possible that the present specimen might be referable to Sowerby's species. However, for the present at least, we are inclined to regard these northern shells as belonging to a subspecies of *S. corrugata*, at least until a comparison can be made with a series of specimens from Peru, the type locality of Sowerby's species.

It appears that in some cases, *Semele corrugata californica* has been confused with *Semele flavescens* Gould, a different shell.

*Distribution*: A single valve of this subspecies was taken by the expedition on the beach at Cape San Lucas. It also occurs in the Pleistocene of Magdalena Bay, Lower California. The record "*Semele cf. pulchra* Sowerby" in the list of species cited by Jordan, 1936, as occurring in the Pleistocene of Magdalena Bay, is referable to *S. corrugata californica*. Olsson has recorded "*Semele cf. californica* Con." as occurring in the Pleistocene of Panama. Records of the occurrence of this shell in Asiatic seas are referable to some other species.

#### *Semele craneana* Hertlein & Strong, sp. nov.

Plate I, Figs. 19, 22.

Shell oval, compressed, thin, with the beaks a little nearer the posterior end, yellowish, with faint, pinkish, interrupted radial stripes; posterior dorsal margin sloping, slightly convex, forming a distinct angle with the truncated posterior end, anterior dorsal margin more direct, slightly concave, anterior dorsal margin well rounded; lunule very small, indistinct; outer surface smooth near the beaks gradually developing concentric ridges which are strongest near the margins, with deep interspaces which about equal the ridges in width; posterior end with a depression running from near the beaks to the lower end of the truncation, posterior to which the shell is flattened and somewhat flexed; radial sculpture entirely absent; interior white, somewhat iridescent, showing the concentric sculpture and pinkish rays quite distinctly; pallial sinus broad, ascending, rounded at the end and projecting about two-thirds the length of the shell; two cardinal teeth, the posterior one the larger, lateral teeth small. The type measures: length, 38 mm.; height, 29.5 mm.; convexity (one valve), 6.5 mm.; pallial sinus projects forward 24 mm. from the posterior margin of the shell.

Holotype, a left valve, (Calif. Acad. Sci. Paleo. Type Coll.), dredged in the Gulf of California. One left valve was dredged on Arena Bank, Gulf of California, Station 136-D-24, Lat. 23° 29' N., Long. 109° 23' 30" W., in 50 fathoms (91 meters), mud, *Arca* conglomerate; one young specimen and a single right valve were dredged in the same general locality, Station 136-D-26, Lat. 23° 27' N., Long.

109° 24' W., in 45 fathoms (82 meters), sand, crushed shell; a single valve was dredged 3 miles off Pyramid Rock, Clarion Island, Station 163-D-2, Lat. 114° 45' N., Long. 114° 45' W., in 55 fathoms (100 meters), rock, coral.

This shell is similar in size and shape to *Semele tabogensis* Pilsbry & Lowe. The sculpture is similar but lacks the fine radial ornamentation of that species and the posterior area is more distinct.

The shell of *Semele craneana*, although less arcuate ventrally, is similar to that of *S. martinii* Reeve<sup>7</sup> which was originally described from Brazil.

This species is named for Miss Jocelyn Crane, Technical Associate, Department of Tropical Research, New York Zoological Society, who accompanied the Templeton Crocker Expedition, 1936, during the course of which the type specimen of the present species was collected.

*Distribution*: This new species is at present known only from the southern portion of the Gulf of California and from off Clarion Island, in 45-55 fathoms.

#### *Semele decisa* Conrad.

*Amphidesma decisa* Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Vol. 7, 1837, p. 239, pl. 19, fig. 2. "Inhabits with the preceding" [which is "Inhabits deep water in the vicinity of Sta. Diego"].—Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, 1853, species 24, pl. 4, fig. 24. San Diego, California.

*Semele decisa* Conrad, Grant & Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 376, pl. 14, figs. 13a, 13b. Earlier records cited. Pleistocene and Recent.

*Type Locality*: San Diego, California, in deep water.

*Range*: San Pedro, California, to Cape San Lucas, Lower California.

*Collecting Station*: Mexico: Cape San Lucas, Lower California.

*Description*: Shell rounded, thick, sub-equilateral, the anterior side the longer, the end rounded; posterior dorsal margin nearly straight, the posterior end truncated; posteriorly biangulate, the area between somewhat concave; ornamented with numerous, thick, unequal concentric rugose ribs, the entire surface covered with fine radial grooves or fine wrinkled and granulated sculpture; colored exteriorly by whitish-gray with occasional purple in the concentric grooves; cardinal teeth obsolete, laterals present; pallial sinus wide, rounded at the end, slightly ascending and extending forward about five-eighths the length of the shell which is past a line vertical with the beaks; interior white with purple around the dorsal margin.

A specimen from Cape San Lucas, Lower California, measures: length, 45 mm.; height, 42.5 mm.; convexity (both valves together), 19.8 mm.; pallial sinus extends an-

teriorly 27 mm. from the posterior margin of the shell. A large specimen of this species from Magdalena Bay, Lower California, in the Henry Hemphill collection of the California Academy of Sciences measures: length, 94 mm.; height, 86.5 mm.; convexity (both valves together), 45.5 mm.; pallial sinus extends anteriorly 59 mm. from the posterior margin of the shell.

The shell of *Semele punctata* Sowerby<sup>8</sup>, which was described from the Galápagos Islands, is more elongate in outline and less truncated posteriorly than that of *S. decisa*.

*Semele nisigotoensis* Nomura & Hatai<sup>9</sup>, described from the Miocene of Japan, was compared to *S. decisa*.

*Distribution*: A few specimens of this species were collected by the expedition at Cape San Lucas, Lower California. This is an extension south of the known range of the species. It also has been recorded as occurring in the Pleistocene of Tomales Bay in Central California, in southern California, and south to Magdalena Bay, Lower California.

#### *Semele flavescens* Gould.

*Amphidesma flavescens* Gould, *Proc. Boston Soc. Nat. Hist.*, Vol. 4, November, 1851, p. 89. "San Diego, Lieut. Green."—Gould, *Boston Jour. Nat. Hist.*, Vol. 6, 1853, p. 392. Original locality cited.

*Amphidesma proximum* C. B. Adams, *Ann. Lyceum Nat. Hist. New York*, Vol. 5, July, 1852, pp. 513, 547 (separate, pp. 289, 323). "Habitat. — Panama."—Hanley, *Cat. Rec. Bivalve Shells*, p. 341, 1856, pl. 12, fig. 5, 1843 (cited as *Amphidesma corrugatum* on expl. to plate). "Mexico."

*Amphidesma proxima* Adams, Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, 1853, species 20, pl. 3, fig. 20. "Hab. Panama." [A reproduction of this figure given by M. Smith, *Panamic Mar. Shells (Tropical Photogr. Lab., Winter Park, Florida)*, 1944, fig. 805].

*Semele flavescens* Gould, Lamy, *Journ. de Conchyl.*, Vol. 61, No. 3, 1914, p. 358. Gulf of California; Panama.

*Semele proxima* C. B. Adams, Olsson, *Nautilus*, Vol. 37, No. 4, 1924, p. 129. Zorritos, Lobitos, Negritos, Peru.

*Type Locality*: San Diego, California.

*Range*: Catalina Island, California (Dall), to Negritos, Peru.

*Collecting Station*: Costa Rica: Golfito Bay, Gulf of Dulce.

*Description*: Shell subrotund, compressed, sculptured by concentric lamellar decussate striae, orange becoming white in later stages and covered with a periostracum which is

<sup>8</sup> *Amphidesma punctatum* Sowerby, *Conch. Illustr., Amphidesma*, Catal. issued with Pt. 19, No. 18, pl. 11, fig. 7, issued between January 18 and March 8, 1833. "Galapagos Islands. Mr. Cumins."—Sowerby, *Proc. Zool. Soc. London* for 1832 (issued March 13, 1833), p. 200. "Hab ad Insulas Gallapagos."—Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, October, 1853, species 26, pl. 4, fig. 26 (as *Amphidesma punctata*). Galápagos Islands.

<sup>9</sup> *Semele nisigotoensis* Nomura & Hatai, *Saito Ho-On Kai Mus. Res. Bull.*, No. 10, 1936, p. 131, pl. 16, figs. 8, 9. Nisigoto. Tanagura Beds, northwest Honshu, Japan, middle Miocene.

<sup>7</sup> *Amphidesma martinii* Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, November, 1853, species 43, pl. 6, fig. 43. "Hab. Rio." [A. Adams' description of this species did not appear until July 25, 1854].

brown shaded with gray (fusco); beaks median, acute, not at all elevated; anterior dorsal area excavated, posterior lanceolate, concave bounded by a line; interior tinted yellow, marked with shiny dots; pallial sinus spatulate, sculptured by close divergent striae; ligamental pit deep, elongate; anterior lateral teeth approximate to the beaks. Long.  $2\frac{3}{8}$ ; alt.  $2\frac{1}{8}$ ; lat.  $1\frac{1}{4}$  poll. (Translation of Gould's original description).

"Usually found about half the above size; the concentric lamellae become worn off and more irregular towards the margin. The interior is faintly tinted yellow when young, but very richly so when old. It is near *A. corrugatum*, Sowb."

The description given by Gould in 1853 is an enlargement of the original. He stated: . . . "posterior dorsal edge long lanceolate, concave, bounded by a distinct angle; surface pale orange near the beaks, becoming dingy white at the older stages, and covered by a dirty greenish epidermis; marked by concentric lamellar striae, crossed by fine radiating striae, especially across the disk."

A left valve in the present collection measures: length, 47.5 mm.; height, 43.8 mm.; convexity (one valve), 11.2 mm. A specimen from Loreto, Lower California, in the collections of the California Academy of Sciences measures: length, 58.5 mm.; height, 55.4 mm.; convexity (both valves together), 28.3 mm.; pallial sinus extends forward 36 mm. from the posterior margin. A large single left valve from Magdalena Bay, Lower California, in the collection of the same institution measures: length, 64.4 mm.; height, 63.4 mm.; convexity (one valve), 15 mm.; pallial sinus extends anteriorly 40 mm. from the posterior margin of the shell.

Gould's type specimen has never been illustrated but the foregoing description applies exactly to specimens of a species in the collection of the California Academy of Sciences which were collected from Lower California to Panama. This species is identical with the one illustrated by Reeve under the name of *Amphidesma proxima* Adams. According to Dall<sup>10</sup> Adams' species is identical with *Semele flavescens*. *Amphidesma proximum* C. B. Adams was founded upon a specimen from Panama 1.8 inches in length. It was said to be closely related to *Semele elliptica* Sowerby and *S. lenticulare* Sowerby. Carpenter<sup>11</sup> regarded *S. proxima* as identical with *S. elliptica*. Whether or not *S. proxima* is identical with *S. flavescens* may be open to doubt but certainly Reeve's figure attributed to that species is referable to *S. flavescens*.

In some cases *Semele flavescens* has been identified under the name of *Semele striosa* C. B. Adams<sup>12</sup>. That species was based upon

a single specimen from Panama .78 inch in length and it appears uncertain exactly how it differs from related forms. In the original description it is mentioned . . . "corselet and lunule not well defined." This does not agree with *S. flavescens* which has a well developed escutcheon.

*Semele mediamericana* Pilsbry & Lowe<sup>13</sup> differs from *S. flavescens* in lacking the strong escutcheon and in the sculpture in which . . . "there are narrow, thread-like concentric ridges, coarser and more raised than in *S. flavescens*, a little less than one mm. apart on the lower part of the valve, and a very minute, dense, even radial sculpture throughout, diverging at both ends, and seen under the lens to be totally unlike the radial striation of *S. flavescens*."

*Distribution*: A single left valve of *Semele flavescens* was taken by the expedition at Golfito Bay in the Gulf of Dulce. It occurs fairly commonly from Magdalena Bay to the Gulf of California and south to Panama and apparently to Peru. We have not seen specimens from north of Magdalena Bay, but the type locality is San Diego, and Dall cited it as occurring north to Catalina Island. It also occurs in the Pliocene of the Gulf of California region and in the Pleistocene of Magdalena Bay, Lower California, and it has been recorded as occurring in the Quaternary of Ecuador. Olsson, 1932, cited "*Semele* cf. *flavescens* Gould" as occurring in the Miocene of Peru.

#### *Semele guaymasensis* Pilsbry & Lowe.

*Semele guaymasensis* Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 92, pl. 12, figs. 8 and 9. "Guaymas, 20 fathoms."—E. K. Jordan, *Contrib. Dept. Geol. Stanford Univ.*, Vol. 1, No. 4, 1936, p. 145. Magdalena Bay, Lower California, Pleistocene. Also Gulf of California, Recent.

*Type Locality*: Guaymas, Sonora, Mexico, in 20 fathoms.

*Range*: Punta Penasco, Sonora, Mexico, to La Paz, Lower California.

*Collecting Station*: Mexico: Santa Inez Bay, Gulf of California (145-D-1, 3), 4-13 fathoms, sand.

*Description*: The shell is light buff, faintly mottled or obscurely rayed with dull light purple, the dorsal borders dark purple. Shape irregularly oval, nearly equilateral, strongly compressed; dorsal margin slightly convex behind, straight in front of the beaks; ends rounded; ventral margin strongly convex. Sculpture of strong, concentric ridges generally a little wider than their intervals, a little lamellar at the border of the escutcheon, and on the anterior end cut by about seven radial grooves. Escutcheon very narrow, flattened, with weak growth lines only, purple. Lunule small, sunken, the dorsal area beyond it pur-

<sup>10</sup> Dall, W. H., *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 67, 1915, p. 25.

<sup>11</sup> Carpenter, P. P., *Proc. Zool. Soc. London*, 1863, p. 367. Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, p. 203.

<sup>12</sup> *Amphidesma striosum* C. B. Adams, *Ann. Lyceum Nat. Hist. New York*, Vol. 5, July, 1852, pp. 513, 547 (separate pp. 201, 323). "Habitat.—Panama."

<sup>13</sup> *Semele mediamericana* Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 92, pl. 12, figs. 1, 1a, 2 (as *Semele modiamericum* on expl. to pl.). "Nicaragua (McNeil)."

ple and smooth except for lines of growth. The interior is stained with dull purple on a buff or white ground, with purple markings on the ventral border. The pallial sinus occupies about two-thirds of the length. Length, 16 mm.; height, 12.3 mm.; semidiam. (right valve), 2.6 mm. Length, 22 mm.; height 17 mm.; semidiam. (right valve) 4 mm. (Original description.)

This species differs from *Semele pulchra* Sowerby and *S. quentinensis* Dall in the much coarser and more widely spaced concentric sculpture.

*Semele anteriocosta* Vokes<sup>14</sup>, described from the Miocene of Trinidad, is similar to *S. guaymasensis* in its general characters but the strength of the ribbing appears to be intermediate between that of this species and *S. quentinensis*.

*Distribution*: A few specimens referable to this species were dredged by the expedition in Santa Inez Bay, in the Gulf of California, in 4-13 fathoms, on a sandy bottom.

#### *Semele jaramija* Pilsbry & Olsson.

Plate I, Fig. 12.

*Semele jaramija* Pilsbry & Olsson, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 93, September 9, 1941, p. 70, pl. 17, fig. 5. "Canoa formation, Punta Blanca." Ecuador, Pliocene.

*Type Locality*: Canoa formation, Punta Blanca, Ecuador, Pliocene.

*Range*: Santa Inez Bay, Gulf of California.

*Collecting Station*: Mexico: Santa Inez Bay, Gulf of California (145), on shore.

*Description*: Shell small, suboval in form, with the beaks placed a little in back of the middle; but little convex; the sculpture consists of strong, regular, concentric threads, well developed over the whole shell and at the anterior-upper end, these concentric threads are cut by a series of small radial grooves; at the posterior end the grooves, about 8 in number, are crossed by the concentric threads, the sculpture being beautifully cancellated. Length, 21 mm.; height, 16 mm.; semidiameter, 3.5 mm. (Original description.)

A left valve of this species in the present collection measures: length, 16 mm.; height, 12.2 mm.; convexity (one valve), 2.9 mm.; pallial sinus extends anteriorly 9.5 mm. from the posterior margin of the shell.

The present specimen agrees exactly with the illustration of *Semele jaramija* given by Pilsbry & Olsson.

As mentioned in the discussion of *Semele pacifica*, that species always has radial sculpture on both the anterior and posterior dorsal areas. The variation in *S. pacifica* Dall is so great that it appears quite possible that the form here cited as *S. jaramija* may be merely a subspecies of it.

<sup>14</sup> *Semele anteriocosta* Vokes, *Amer. Mus. Novit.*, No. 988, May 16, 1938, p. 14, fig. 5. Upper Miocene of Springvale, Trinidad, British West Indies.

*Semele guaymasensis* Pilsbry & Lowe and *S. quentinensis* Dall have radial sculpture usually only on the anterior dorsal area and when present at all posteriorly it is much less strongly developed than that on *S. jaramija*.

*Distribution*: A single left valve here referred to *Semele jaramija* was taken by the expedition on shore at Santa Inez Bay in the Gulf of California. This species has also been recorded as occurring in the Pleistocene of Panama and in the Pliocene at Punta Blanca, Ecuador.

#### *Semele jovis* Reeve.

*Amphidesma jovis* Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, November, 1853, species 34, pl. 5, fig. 34. "Hab.—?"

*Semele jovis* A. Adams, *Proc. Zool. Soc. London* for 1853 (issued July 25, 1854), p. 94. "Hab. ? Mus. Cuming."

*Tellina barbarae* Boone, *Bull. Bingham Oceanogr. Coll.* Peabody Mus. Yale Univ., Vol. 2, Art. 5, December, 1928, p. 9, pl. 1 (upper figure). "Pearl Islands, depth 12 fathoms."

*Type Locality*: Port Parker, Costa Rica (here designated as type locality). No locality cited originally.

*Range*: Kino Bay, Sonora, Mexico, in the Gulf of California, to the Las Perlas Islands, Panama.

*Collecting Stations*: Mexico: Port Guatulco (195-D-2), 3 fathoms, sand; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves; Costa Rica: Port Parker (203-D-1-3), 12-15 fathoms, sandy mud, crushed shell, shelly sand, algae, shelly mud.

*Description*: Shell somewhat roundly ovate, somewhat ventricose, anterior side slightly the longer; posterior side with a flexure, the end truncated; ornamented with rather thin, close-set, concentric lamellae; the interspaces with fine concentric lineation; extremely fine radial wrinkling present on fresh specimens but clearly noticeable on worn specimens; color rose-fawn, beaks red with a medial white streak; hinge with two cardinals and laterals in each valve; pallial sinus broadly elliptically rounded, projecting forward about four-sevenths the length of the shell; interior rose and white.

A right valve from Port Guatulco, Mexico, measures: length, 54.5 mm.; height, 45 mm.; convexity (one valve), 10.3 mm.; pallial sinus extends anteriorly 32.5 mm. from the posterior margin of the shell. A specimen collected by H. N. Lowe at Kino Bay, Sonora, Mexico, in the Gulf of California, measures 59 mm. in length.

*Semele rosea* Sowerby<sup>15</sup>, described from Peru, is more orbicular in outline than *S. jovis*.

<sup>15</sup> *Amphidesma roseum* Sowerby, *Conch. Illustr.*, Catal. issued with Pt. 19, species No. 5, pl. 17, fig. 1, issued between January 18 and March 8, 1833. "Tumbez, Peru. Mr. Cuming."—Sowerby, *Proc. Zool. Soc. London* for 1832 (issued March 13, 1833), p. 199. "Hab. ad littora Peruviae." "A single valve was found at Tumbez in Peru."—Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, October, 1853, species 17, pl. 3, fig. 17 (as *Amphidesma rosea*). Tumbez, Peru.

According to Verrill the lamellae are more closely spaced and the plication of *Semele jovis* is nearer the outer edge as compared to that of *S. junonia* Verrill<sup>16</sup> which was described from La Paz, Lower California. He mentioned the presence of radiating striae in the interspaces of *S. junonia*, a feature also present and especially noticeable on somewhat worn specimens of *S. jovis*. According to Lamy<sup>17</sup> *Semele junonia* is only a variety of *S. rosea*.

**Distribution:** A few single valves of *Semele jovis* were dredged by the expedition off western Mexico, Nicaragua, and Costa Rica.

#### *Semele laevis* Sowerby.

*Amphidesma laeve* Sowerby, Conch. Illustr., Catal. issued with Pt. 19, No. 22, pl. 18, fig. 6, issued between January 18 and March 8, 1833. "Xipixapi. W. Col. Mr. Cuming."—Sowerby, *Proc. Zool. Soc. London* for 1832 (issued March 13, 1833), p. 199. "Hab. ad Xipixapi, Columbiae Occidentalis." "A single specimen of this very delicate species was dredged from a depth of ten fathoms in sandy mud."

*Amphidesma laevis* Sowerby, Reeve, Conch. Icon., Vol. 8, *Amphidesma*, November, 1853, species 50, pl. 7, fig. 50. Original locality cited.

**Type Locality:** Xipixapi [Jipijapa], Ecuador, in 10 fathoms, sandy mud.

**Range:** Champerico, Guatemala, to Jipijapa, Ecuador.

**Collecting Stations:** Guatemala: 7 miles west of Champerico (197-D-1-2), 14 fathoms, mud; El Salvador: La Libertad (198-D-1-2), 13-14 fathoms, mud; Costa Rica: Gulf of Dulce.

**Description:** Shell elongately ovate, inequilateral, the anterior side the longer, smooth, exterior and interior white; anterior dorsal margin nearly straight, sloping, anterior end tapering and rounded; ventral margin curved; posterior dorsal margin rounded and highest just back of the beaks, posterior end rounded; a broad, shallow, radial groove is present on the posterior area and where this meets the ventral margin there is sometimes a vague truncation; surface smooth except for concentric lines of growth and an occasional concentric groove and sometimes with fine submicroscopic radial striae; hinge of right valve with two small cardinals, the posterior one bifid, the anterior one thin, two laterals present, left valve with two cardinals, the anterior one bifid, the posterior one thin, also projections of the margin which fit into corresponding sockets in the right valve; pallial sinus somewhat elevated above then broadly tapering to a rounded point which projects forward about five-eighths the length of the shell.

<sup>16</sup> *Semele junonia* Verrill, *Amer. Jour. Sci.*, Ser. 2, Vol. 69, No. 146, March, 1870, p. 217. "Near La Paz,—Capt. J. Pedersen."

<sup>17</sup> Lamy, E., *Journ. de Conchyl.*, Vol. 61, No. 3, 1914, p. 357.

A large right valve from off La Libertad, El Salvador, measures approximately: length, 68 mm.; height, 53 mm.; convexity (one valve), 13 mm.; pallial sinus extends anteriorly 48.4 mm. from the posterior margin of the shell.

*Semele laevis* var. *costaricensis* Olsson<sup>18</sup> has been described from the Miocene of Costa Rica and later was cited as also occurring in the Miocene of Peru.

*Semele pallida* Sowerby<sup>19</sup>, described from Ecuador, bears a resemblance, in general features, to *S. laevis* but differs in that it is less elongate anteriorly, less rounded posteriorly, the beaks are more anteriorly situated and the coloration was described as pale purple-fulvous.

**Distribution:** Specimens of this species were dredged off Guatemala and El Salvador in 13-14 fathoms and were taken on the beach of the Gulf of Dulce. These occurrences extend the known range of the species considerably to the north as heretofore it has not been reported north of Panama. This species also has been recorded as occurring in the Pleistocene of Panama and in the Pliocene at Puerto Jama, Ecuador.

#### *Semele pacifica* Dall.

Plate I, Fig. 11.

*Semele pacifica* Dall, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 61, March 2, 1915, p. 27. "Catalina Island, California, to Acapulco, Mexico, in 9 to 21 fathoms."—I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 180, pl. 3, fig. 5. Original range cited.—J. Q. Burch, *Min. Conch. Club South. Calif.*, No. 43, January, 1945, p. 17. "Dr. A. M. Keen advises 'Type locality of *S. pacifica* is: U. S. B. F. Sta. 2022, off La Paz, in 21 fms.'"

**Type Locality:** Off La Paz, Lower California, in 21 fathoms (Keen).

**Range:** Catalina Island, California, to the Gulf of California and south to Taboga Island, Panama.

**Collecting Stations:** Mexico: Santa Inez Bay, Gulf of California (145-D-1, 3), 4-13 fathoms, sand, also on shore; Costa Rica: Port Parker (203-D-3), 12 fathoms, shelly mud; Golfo, Gulf of Dulce.

**Description:** The shell of this species is very similar to that of *Semele cancellata* Sowerby<sup>20</sup> which occurs in Atlantic waters.

<sup>18</sup> *Semele laevis* Sowerby, var. *costaricensis* Olsson, *Bull. Amer. Paleol.*, Vol. 9, Bull. 39, Pt. 2, June 21, 1922, p. 430 (258), pl. 32 (29), fig. 1. "Gatun Stage: Hill No. 3, Banana River," Costa Rica, Miocene.

<sup>19</sup> *Amphidesma pallidum* Sowerby, Conch. Illustr., Catal. issued with Pt. 19, sp. No. 3, pl. 17, fig. 3, issued between January 18 and March 8, 1833. "Salango, W. Col. Mr. Cuming."—Sowerby, *Proc. Zool. Soc. London* for 1832 (issued March 13, 1833), p. 199. "Hab. ad Salango, Columbiae Occidentalis." "Dredged in sandy mud at a depth of seven fathoms."—Reeve, Conch. Icon., Vol. 8, *Amphidesma*, 1853, species 22, pl. 4, fig. 22 (as *Amphidesma pallida*). Original locality cited.

<sup>20</sup> *Amphidesma cancellatum* Sowerby, Conch. Illustr., Catal. issued with Pt. 19, species No. 13, issued between January 18 and March 8, 1833. "Antigua and St. Vincents." Ref. to "Spec. Conch. f. 8."—Reeve, Conch. Icon., Vol. 8, *Amphidesma*, 1853, species 44, pl. 7, fig. 44 (as *Amphidesma cancellata*). "Hab.—?."

Dall stated in the original description that it . . . "differs from that Atlantic species in its smaller lunule, shorter and weaker right lateral tooth, and sharper and more delicate concentric sculpture."

A left valve in the present collection from Golfito, Gulf of Dulce, Costa Rica, measures: length, 20 mm.; height, 16.6 mm.; convexity (one valve), 4.6 mm.

*Semele pacifica* is a very variable species. Young specimens have rather flattened shells and strong cancellate sculpture with the concentric lamellae well developed. In the adult stage the shells become thicker, more ventricose, and with the radial element in the sculpture as strong or stronger than the concentric. The radial sculpture is always present near the anterior and posterior dorsal margins and sometimes covers the whole shell.

*Semele pacifica* is one of a group of related species which vary in details of sculpture. *Semele venusta* Reeve has no radiating sculpture. *Semele guaymasensis* Pilsbry & Lowe has strong concentric sculpture but with incised radiating sculpture only on the anterior dorsal area. *Semele quentinensis* Dall has very fine concentric sculpture with radial sculpture on the anterior dorsal portion and, rarely, with a few faint striae along the posterior dorsal margin. *Semele pulchra* Sowerby has concentric and radial sculpture similar to that of *S. quentinensis* but the shell is higher in proportion to the length as compared to Dall's species. *Semele jaramija* Pilsbry & Olsson, described from the Pliocene of Ecuador, has concentric sculpture intermediate in strength between that of *S. quentinensis* and *S. guaymasensis*, but in addition to similar radial sculpture on the anterior dorsal area it also has strong, incised radial sculpture on the posterior dorsal area. *Semele pacifica* has strong well developed concentric sculpture with radials on both the anterior and posterior portions and sometimes all over the shell.

*Distribution*: A few specimens of *Semele pacifica* were dredged by the expedition in 4-13 fathoms in Santa Inez Bay, in the Gulf of California, at Port Parker, Costa Rica, in 12 fathoms, and at Golfito in the Gulf of Dulce.

### *Semele pulchra* Sowerby.

Plate I, Fig. 15.

*Amphidesma pulchrum* Sowerby, *Proc. Zool. Soc. London*, June 5, 1832, p. 57. "Hab. in Sinu Caraccensi, Americae Meridionalis."—Sowerby, *Conchyl. Illustr.*, Catal. issued with Pt. 19, species No. 2, pl. 17, fig. 2, issued between January 18 and March 8, 1833, "St. Elena W. Columbia." Var. fig. 2\*. Panama.

*Amphidesma pulchra* Sowerby, Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, October, 1853, species 2, pl. 1, fig. 2. Original locality cited.

*Type Locality*: Bay of Caraccas, Ecuador.

*Range*: Gulf of Fonseca, Nicaragua, to Ecuador.

*Collecting Stations*: Nicaragua: Potosi and 5 miles SSW. of Monypenny Point, Gulf of Fonseca.

*Description*: Shell trigonally ovate, fairly thick, anterior side the longer, sloping and rounded at the end; posterior side with a fold, the end roundly truncated; ventral margin rounded; sculptured with fine close concentric riblets, on the anterior end these are decussated by several (10-15) incised radial lines; color pale yellowish-gray with purple blotches and ^-shaped markings; pallial sinus higher in front of the adductor impression then gently sloping to a broadly rounded end which projects forward about three-fifths the length of the shell; hinge normal; interior colored white with the umbonal half and the hinge purple or tinged with purple.

A typical specimen from Nicaragua measures: length, 31 mm.; height, 25.4 mm.; convexity (both valves together), 12.5 mm.; pallial sinus projects anteriorly 19.8 mm. from the posterior margin of the shell.

The shells here referred to *Semele pulchra* agree exactly with the figures of that species given by Sowerby and by Reeve. *Semele quentinensis* Dall, a closely related species which has usually been cited under the name of *S. pulchra*, occurs from southern California to Central America. It is more elongate in outline, the anterior dorsal margin slopes more gently from the beaks, the shell is thinner and the purple coloration is more weakly developed.

*Distribution*: Only three specimens of this species were taken by the expedition in the Gulf of Fonseca. It ranges south to Ecuador.

### *Semele quentinensis* Dall.

Plate I, Fig. 10.

*Semele quentinensis* Dall, *West Amer. Sci.*, Vol. 19, No. 3, June 15, 1921, p. 22. "Pliocene or Early Pleistocene of San Quentin."—Dall, *Proc. U. S. Nat. Mus.*, Vol. 66, No. 2554, Art. 17, 1925, p. 26, pl. 8, fig. 4. "Pliocene (?) of San Quentin Bay, Lower California."

*Type Locality*: San Quintin, Lower California, Pleistocene.

*Range*: Point Mugu, Ventura County, California, to Costa Rica.

*Collecting Stations*: Guatemala: 7 miles west of Champerico (197-D-2), 14 fathoms, mud; El Salvador: Meanguera Island, Gulf of Fonseca (199-D-1), 16 fathoms, sand, mud, crushed shell; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves; Costa Rica: 1 mile south of Golfito.

*Description*: Shell small, inequilateral, inequivalve, rather compressed, anterior end longer, terminally rounded; posterior end obscurely subtruncate, base moderately arcuate; beaks inconspicuous; surface finely concentrically closely sculptured, with fine radial threads chiefly visible in the sulci; at the anterior end are about a dozen stronger sulci, cutting and more or less beading the concentric sculpture, but this feature is not



repeated at the posterior end; hinge normal, well developed; pallial sinus large, subovate, nearly reaching the anterior adductor scar, and entirely free from the pallial line; the left valve slightly flatter than the right valve. Length, 24; height, 19; diameter, 8 mm. (Original description).

A large specimen from the Gulf of Fonseca in the present collection measures: length, 27.3 mm.; height, 20.8 mm.; convexity (both valves together), 8.9 mm.; pallial sinus extends anteriorly 18 mm. from the posterior margin of the shell.

The shell of this species is very similar to that of *Semele pulchra* but the length is greater in proportion to the height and the anterior dorsal margin slopes more gently from the beaks. The specimens in the present collection are thinner and the purple coloration is less pronounced than that of *S. pulchra*. These shells possess fine, even, concentric sculpture which along the anterior dorsal margin is crossed by incised radial lines giving a beaded appearance to that portion of the shell. These specimens agree exactly with Dall's description and illustration of *Semele quentinensis* which was based on a fossil specimen from the Pleistocene of San Quintin, Lower California. These appear to be identical with the species occurring in southern California which generally has been cited in the literature under the name of *Semele pulchra*. The only difference seems to be in size, those from southern California seldom exceeding 20 mm. in length. A few specimens of this northern form also possess a few incised radial lines along the posterior dorsal margin but they are fewer and much weaker than those on the anterior dorsal margins and thus differ from the sculpture of *Semele jaramija* Pilsbry & Olssen which was originally described from the Pliocene of Ecuador. *Semele guaymasensis* Pilsbry & Lowe has more widely spaced and coarser concentric sculpture.

**Distribution:** Specimens of *Semele quentinensis* were dredged by the expedition in 12 to 16 fathoms from Guatemala to Costa Rica. It also is known to occur in the Pleistocene of southern California and Lower California.

#### *Semele simplicissima* Pilsbry & Lowe.

*Semele simplicissima* Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 93, pl. 12, figs. 6, 6a. "Acapulco, 20 fathoms."

**Type Locality:** Acapulco, Mexico, in 20 fathoms.

**Range:** Santa Inez Bay, Gulf of California, to Acapulco, Mexico.

**Collecting Stations:** Mexico: Arena Bank (136-D-2, 5), 33-45 fathoms, mud, *Arca conglomerates*, sand, weed; Santa Inez Bay (143-D-2, 3, 4), 25-35 fathoms, mud, crushed shell; Santa Cruz Bay (195-D-21), 18 fathoms, mud; Costa Rica: Port Parker (203-D-3), 12 fathoms, shelly mud; 14 miles S. X

E. of Judas Point (214-D-1, 4), 42-61 fathoms, mud, shell, rocks.

**Description:** Shell ovate, thin, moderately inflated at the umbos, beaks near the middle; anterior dorsal margin sloping, nearly straight, end rounded, ventral margin broadly rounded, posterior end a little higher than the anterior, convex dorsally, in large specimens decidedly truncated at the end where the fold reaches the margin; sculpture of very fine, fairly regular, low, concentric ridges which are covered by such fine, concentric lines that they disperse light into spectral colors; the interspaces are flat and without either concentric or radial striation; lunule lanceolate and rather deeply concave; pallial sinus ascending, rounded at the end and projecting a little beyond the middle of the shell; color dingy white and on the interior of fresh specimens a salmon pink or dark orange flush covers the umbonal half of the shell.

Some specimens in the present collection are much larger than the type of this species. The largest shell, a left valve, measures: length, 33 mm.; height, 24.3 mm.; convexity (one valve), 6.4 mm.; pallial sinus projects anteriorly 19 mm. from the dorsal margin of the shell. One pair of valves from Arena Bank measures, approximately: length, 29.5 mm.; height, 22.8 mm.; convexity (both valves together), 12.2 mm.; pallial sinus extends anteriorly 16.5 mm. from the posterior margin of the shell.

The present specimens have been identified after a comparison with paratypes of *Semele simplicissima* in the H. N. Lowe collection in the San Diego Society of Natural History. This species appears to be very similar to the one described as *Semele regularis* Dall<sup>21</sup> [= *Semele paziana*, new name], but differs in that the intervals between the ribs are smooth and usually not ornamented by concentric striations. However, some specimens here referred to *S. simplicissima* bear sub-microscopic striae in the interspaces.

*Semele sayi* Toulou, 1909, described from the Gatun Miocene of Panama, and especially *S. quirosana* H. K. Hodson, 1931, described from the Upper Oligocene or Miocene of Venezuela, bear a resemblance to *S. simplicissima*.

**Distribution:** Specimens of this species were dredged by the expedition from Santa Inez Bay in the Gulf of California, to off Judas Point, Costa Rica, at depths of 12 to 61 fathoms. These records of occurrence furnish new extensions both north and south of the known range of the species.

#### *Semele sparsilineata* Dall.

Plate I, Fig. 8.

*Semele sparsilineata* Dall, *Proc. Acad. Nat.*

<sup>21</sup> *Semele regularis* Dall, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 67, issued March 2, 1915, p. 27. "Gulf of California, off La Paz, in 10 to 30 fathoms."

Not *Semele regularis* E. A. Smith, *Sci. Res. Voy. Challenger*, Zool., Vol. 13, Lamell., 1885, p. 87, pl. 5, figs. 4, 4a, 4b. East of Cape York, North Australia in 155 fathoms.

A new name *Semele paziana* is here proposed for the west American species named *Semele regularis* by Dall.

*Sci. Philadelphia*, Vol. 67, issued March 2, 1915, p. 26. "Panama, 18 fathoms." Also recorded from "Chile, Hupé."

*Type Locality*: Panama, in 18 fathoms.

*Range*: Corinto, Nicaragua, to Taboga Island, Panama. To Chile (Dall).

*Collecting Station*: Panama: Gulf of Chiriqui (221-D-1, 5), 35-40 fathoms, sandy mud.

*Description*: Shell ovately oblong, the anterior portion much the longer, the end rounded, ventral margin rounded, posterior end slightly higher, slightly subtruncated, a flexure present; sculptured by fine concentric lines of growth which, sometimes anteriorly and sometimes medially, are crossed by fine oblique striations; pallial sinus ascending, broadly rounded at the end, projecting forward about three-fifths the length of the shell; color dingy white with traces of brownish-purple stains.

The larger specimen in the collection, a right valve, measures approximately: length, 25.5 mm.; height, 20.8 mm.; convexity (one valve), 4.7 mm.; pallial sinus extends anteriorly 15.8 mm. from the posterior margin of the shell.

The present specimens are somewhat worn but they show the oblique striae characteristic of this species. It was upon the basis of sparser oblique striae that Dall separated this species from the east American *Semele purpurascens* Gmelin<sup>22</sup>.

*Distribution*: Only two single valves of this species were dredged by the expedition in the Gulf of Chiriqui, Panama, in 35-40 fathoms.

#### *Semele tabogensis* Pilsbry & Lowe.

*Semele tabogensis* Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 91, pl. 12, figs. 5, 5a, 5b. "Taboga Island, among rocks near the bathing beach."

*Type Locality*: Taboga Island, Panama, among rocks.

*Range*: Tangola-Tangola Bay, Mexico, to Taboga Island, Panama.

*Collecting Station*: Mexico: Tangola-Tangola Bay (196-D-7), 6 fathoms, sand.

*Description*: The shell is thin, orange, shading through pink into light coral red near the umbones; very shortly oval, strongly compressed, slightly inequilateral. The broadly rounded anterior end is somewhat lower than the posterior end, which is noticeably truncate. Dorsal margin somewhat

concave in front of the beaks, convex behind them. In the right valve these margins are produced towards the other valve, covering the ligament. Ventral margin is strongly convex. Sculpture of regular, recurved concentric riblets, which become laminar near the dorsal margin, and are somewhat darker colored than their intervals, in which fine, weak, radial striation is seen. Beaks smooth. Lunule extremely small, confined to the right valve. The interior varies in color from carnelian red to apricot orange, smooth, with some scattered glossy dots. Teeth are lighter or whitish in large individuals. Anterior lateral short, the posterior long and thinner. The pallial sinus reaches well past the middle. Length 37.5 mm., height 30.3 mm., semidiam. (right valve) 6.5 mm. (Original description).

The present specimen, a left valve, measures approximately: length, 22.3 mm.; height, 17.3 mm.; convexity (one valve), 4.3 mm.

*Distribution*: A single left valve of this species was dredged by the expedition in Tangola-Tangola Bay, Mexico, in 6 fathoms. This is an extension north of the known range of this species.

#### *Semele venusta* Reeve.

Plate I, Fig. 13.

*Amphidesma venusta* Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, October, 1853, species 3, pl. 1, fig. 3. "Hab. West Columbia."—A. Adams, *Proc. Zool. Soc. London* for 1853 (issued July 25, 1854), p. 96. "Hab. West Columbia. Mus. Cuming."

*Type Locality*: West Colombia.

*Range*: Acapulco, Mexico, to west Colombia.

*Collecting Stations*: Mexico: Port Guatulco (195-D-9), 7 fathoms, gr. sand, crushed shell; Santa Cruz Bay; Tangola-Tangola Bay (196-D-8), 9 fathoms, sand.

*Description*: Shell oblong, transverse, ventricose, rather shining, dull flesh-color, obscurely rayed with rose, anterior side much the longer, posterior slightly truncated, flexuous at the ventral margin; concentrically grooved; purple within, edged with white (Reeve).

A left valve in the present collection from Santa Cruz Bay, Mexico, measures: length, 21.9 mm.; height, 15 mm.; convexity (one valve), 4.2 mm.; pallial sinus extends anteriorly 14 mm. from the posterior margin of the shell.

The pallial sinus of this shell is a distinctive feature. It extends forward about two-thirds the length of the shell; it is broad and higher in front of the posterior adductor impression then tapers elliptically to a rounded point.

The ribbing of *Semele venusta* is somewhat irregular toward the anterior and posterior ends similar to that of *S. incongrua* Carpenter<sup>23</sup> although coarser ventrally. The

<sup>22</sup> *Venus purpurascens* Gmelin, *Syst. Nat.*, ed. 13, Vol. 1, Pars. 6, 1791, p. 3288. Habitat unknown. Ref. to: "List. Conch. t. 303. f. 144."; "B (List. Conch. t. 304. f. 145."; "Klein. ostr. t. 11. f. 57".)

*Tellina obliqua* Wood, *Gen. Conch.*, 1815, p. 152, pl. 41, figs. 4, 5.

This is not *Amphidesma purpurascens* Sowerby (*Conch. Illustr.*, Pt. 19, species No. 19, pl. 18, fig. 5, issued between January 18 and March 8, 1833. "St. Elena. W. Col. Mr. Cuming."—Sowerby, *Proc. Zool. Soc. London* for 1832 (issued March 13, 1833), p. 199. "Hab. ad Sanctam Elenam." "A single valve of this elegant species was picked up on the sands at St. Elena."—Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, November, 1853, species 37, pl. 6, fig. 37); which was renamed *Semele sowerbyi* by Lamy (*Bull. Mus. Nat. Hist. Nat.* (Paris), Vol. 18, No. 3, 1912, p. 165, footnote).

<sup>23</sup> *Semele incongrua* Carpenter, *Rept. Brit. Assoc. Adv. Sci.* for 1863 (issued August, 1864), pp. 611, 640. "Catalina

shell in adult forms is thicker than that of Carpenter's species. Fine radial sculpture is present in the bottoms of the interspaces.

A few small specimens in the present collection from off western Mexico are remarkably similar to *Semele incongrua*. Traces of the pallial sinus appear to be narrowly elliptical at the end similar to that of *S. venusta* rather than broadly rounded as in *S. incongrua*.

The form described as *Semele pulchra* var. *montereyi* Arnold<sup>24</sup>, based on a Pleistocene fossil from San Pedro, California, is, as mentioned by Dall, a subspecies of *S. incongrua*. The type specimen has not been illustrated but the figure given by Arnold represents a shell which appears to be a little more rounded, with sharper, more erect concentric lamellae and with stronger radial ornamentation than that of *S. incongrua*.

Verrill<sup>25</sup> considered *Semele venusta* to be but a young form of *S. formosa* Sowerby. The pallial sinus, elliptically pointed in *S. venusta*, is quite different from the broadly rounded ascending pallial sinus of *S. formosa*.

*Distribution*: A few valves of *Semele venusta* were taken by the expedition at Port Guatulco, Santa Cruz Bay, and Tangola-Tangola Bay, Mexico, in 7 to 9 fathoms.

#### *Semele verrucosa* Mörch.

Plate I, Figs. 21, 24.

*Semele* (*Amphidesma*) *verrucosa* Mörch, Malakozool. Blätter, Bd. 7, December, 1860, p. 190. "Los Bocorones ad prof. 20 org. spec. 2". Costa Rica.

*Type Locality*: Los Bocorones Islands, Costa Rica.

*Range*: Los Bocorones Islands, Costa Rica, to Hannibal Bank, Panama.

*Collecting Station*: Panama: Hannibal Bank (Sta. 224), 35-40 fathoms, rocks, coral, mud, sand, shells, algae.

*Description*: Shell elongately ovate, inequilateral, whitish blotched with purple; anterior side the longer, the end rounded, ventral margin broadly rounded, posterior end broadly rounded and with a gentle fold; sculpture consists of close concentric ribs, these especially anteriorly and posteriorly are wrinkled and give rise to scalloped scale-like projections, the whole finely radially wrinkled; hinge (right valve) with two cardinals and laterals; pallial sinus broadly rounded at the end and gently ascending to about five-eighths the length of the shell.

Is., 40-60 fm.; common." Reprint in *Smithson. Miscell. Co'l.*, No. 252, 1872, pp. 97, 126.—Carpenter, *Proc. California Acad. Nat. Sci.*, Vol. 3, February, 1865, p. 208 (as *Semele incungrua*). "Hab. Santa Barbara, 16 fm. 1 valve; Catalina Island, 40-60 fm., not uncommon; Cooper."—I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 181, pl. 11, figs. 12, 13. "Type locality, Santa Barbara." Range, Monterey, California, to the Coronado Islands, Lower California.

<sup>24</sup> *Semele pulchra* Sowerby, var. *montereyi* Arnold, *Mem. Calif. Acad. Sci.*, Vol. 3, 1903, p. 166, pl. 15, figs. 3, 3a. Lower San Pedro series, San Pedro, California. Pleistocene. Recent in Monterey Bay.

<sup>25</sup> Verrill, A. E., *Amer. Jour. Sci.*, Ser. 2, Vol. 69, No. 146, March, 1870, p. 219.

A right valve measures approximately: length, 43 mm.; height, 32.4 mm.; convexity (one valve), 7.1 mm.; pallial sinus extends anteriorly 26.6 mm. from the posterior margin of the shell.

Mörch pointed out that the shell of *Semele verrucosa* is more elongate in outline, more subtruncate posteriorly, and that the ventral margin is more gently arcuate in outline than that of *S. formosa* Sowerby<sup>26</sup>. The present specimen possesses those characters as well as the pronounced scaly verrucose sculpture characteristic of Mörch's species.

*Distribution*: A single right valve of this species was dredged by the expedition on Hannibal Bank, Panama, in 35-40 fathoms. This is an extension south of the known range of the species.

#### Genus *Abra* Lamarck.

*Abra* Lamarck, *Hist. Nat. Anim. s. Vert.*, Vol. 5, July, 1818, p. 492. Species cited: "*Amphidesma tenuis*" in the synonymy of which was included, "*Maetra tenuis*. Maton, act. soc. linn. 8. p. 72. no. 8" and "*Abra tenuis*. Leach". "Habite les mers d'Angleterre. Communiqué par M. Leach"; "*Amphidesma prismatica*" in the synonymy of which was cited, "*Ligula prismatica*. Montagu. test. brit. suppl. 23. t. 26. f. 3. Ex D. Leach." and "*Abra prismatica*. Leach." "Habite les côtes d'Angleterre. Communiqué par M. Leach."—Gray, *Proc. Zool. Soc. London* for 1847, p. 187. Type: *Maetra tenuis*.—Dall, *Trans. Wagner Free Inst. Sci.*, Vol. 3, Pt. 5, 1900, p. 995. Type: *A tenuis* Montagu.—Woodring, *Carnegie Inst. Washington, Pub.* 366, 1925, p. 179. Type: *Maetra tenuis* Montagu.

*Type* (designated by Gray, 1847): *Maetra tenuis* [Montagu, *Test. Brit.*, Pt. 2, 1803, p. 572, *Suppl.*, 1808, pl. 17, fig. 7. "Southampton, where it is not uncommon on the shore to the west of the town." Also from "Weymouth"—Forbes & Hanley, *Hist. Brit. Moll.*, Vol. 1, 1853 (issued 1848), p. 323, pl. 17, fig. 7. Various localities in England]. [For dates of publication of this work see Fisher and Tomlin, *Jour. Conch.*, Vol. 20, No. 5, August, 1935, pp. 150-151].

Shell small, trigonal; sculpture consisting of incrementals; ligament narrow, resilium seated on a wide, deeply inset chondrophore; hinge of right valve consisting of 2 cardinals (3a, 3b), the posterior one (3b) heavier, and slender anterior and posterior laterals; hinge of left valve consisting of 2 cardinals (2a, 2b), the posterior one (2b) very small; pallial sinus deep, very wide, confluent with pallial line (Woodring).

The genus *Abra* has been recorded as occurring from Eocene to Recent.

<sup>26</sup> *Amphidesma formosum* Sowerby, *Conch. Illustr.*, Catal. issued with Pt. 19, No. 4, pl. 19, fig. 8 [two figs.], issued between January 18 and March 8, 1833. "St. Elena. Mr. Cuming."—Sowerby, *Proc. Zool. Soc. London* for 1832 (issued March 13, 1833), p. 199. "Hab. ad Sanctam Elenam." "Only two odd valves were dredged in seven fathoms water."—Reeve, *Conch. Icon.*, Vol. 8, *Amphidesma*, 1853, species 27, pl. 4, fig. 27 (as *Amphidesma formosa*). Original locality cited.

Lamy<sup>27</sup> cited *Maetra tenuis* Montagu, the type of *Abra*, and similar species, under the genus *Syndesmya* Recluz, 1843, with the type *Maetra alba* Wood, 1801.

*Iacra* H. & A. Adams, 1856, a subgenus of *Abra*, with the type *Scrobicularia seychellarum* A. Adams, 1856, possesses divaricate radial sculpture.

*Abranda* Iredale, 1924, is based upon *Abranda rex* Iredale, an Australian species.

#### KEY TO THE SPECIES OF *Abra*.

- A. Shell elongate  
 a. Posterior end pointed ..... *pacifica*<sup>28</sup>  
 aa. Posterior end blunt ..... *tepocana*<sup>28</sup>  
 B. Shell short; high, inflated ..... *palmeri*

#### *Abra palmeri* Dall.

Plate I, Figs. 16, 18, 20, 23.

*Abra palmeri* Dall, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 67, March 2, 1915, p. 28. "Ballenas Lagoon on the west coast of Lower California; the Gulf of California (Dr. E. Palmer); and Panama Bay in 26 fathoms (U. S.N.Mus.). Type locality, Panama Bay. (U. S.N.Mus., No. 96,301.)"

*Type Locality*: Panama Bay, in 26 fathoms.

*Range*: Ballenas Lagoon on the west coast of Lower California, and the Gulf of California to Panama Bay.

*Collecting Station*: El Salvador: Meanguera Island, Gulf of Fonseca (199-D-1), 16 fathoms, sand, mud, crushed shell.

*Description*: Shell short, high, inflated, white, with a silky surface, and a very thin, polished, pale yellow periostracum; anterior end and base rounded; beaks subcentral, dorsal margins descending, posterior end attenuated and with the extremity rounded; right valve with a deeply bifid (or double) cardinal tooth, the laterals obsolete; left valve with a single cardinal and no laterals. Length 10, height 8, diameter 5.5 mm. The pallial sinus rounded, 6 mm. deep. (Original description).

This species is nearest to *A. lioica* Dall, of the Atlantic Coast of the United States (Dall).

The largest specimen in the present collection measures: length, 10.5 mm.; height, 9.2 mm.; convexity (one valve), 2.8 mm.

The short and high outline of *Abra palmeri* separates it from the two other species described from west American waters, *A. pacifica* Dall, 1915, and *A. tepocana* Dall, 1915, both of which were said to be elongate in outline.

*Distribution*: Several specimens of this species, mostly single valves, were dredged off Meanguera Island, El Salvador, in the Gulf of Fonseca, in 16 fathoms. This is the first record of the occurrence of the species since its original description.

<sup>27</sup> Lamy, E., *Journ. de Conchyl.*, Vol. 61, No. 3, 1914, pp. 268-297.

<sup>28</sup> Not represented in the present collection.

#### Genus *Cumingia* Sowerby.

#### *Cumingia lamellosa* Sowerby.

*Cumingia lamellosa* Sowerby, *Proc. Zool. Soc. London*, May 17, 1833, p. 34. "Hab. prope littora Oceani Pacifici." "Found at Payta in hard clay at low water; and at Panama in deep water."—Sowerby, *Gen. Rec. and Foss. Shells, Cumingia*, Vol. 2, No. 40, ?1833, pl. 244, fig. 3.—Sowerby, *Conch. Icon.*, Vol. 19, *Cumingia*, 1873, species 5, pl. 1, fig. 5. "Hab. Chili".—Lamy, *Journ. de Conchyl.*, Vol. 61, No. 3, 1914, p. 310. Paita, Peru.

*Cumingia coarctata* Sowerby, *Proc. Zool. Soc. London*, May 17, 1833, p. 34. "Hab. ad Sinum Caraccensem." "Dredged from a sandy muddy bottom in seven fathoms water in the Bay of Caraccas". [Ecuador].

*Cumingia trigonularis* Sowerby, *Proc. Zool. Soc. London*, May 17, 1833, p. 35. "Hab. ad Sanctam Elenam." "Found among stones in deep water."—Sowerby, *Gen. Rec. and Foss. Shells*, Vol. 2, No. 40, ?1833, *Cumingia*, pl. 244, fig. 2.—Sowerby, *Conch. Icon.*, Vol. 19, *Cumingia*, 1873, species 4, pl. 1, fig. 4. "Hab. Chili?"

*Cumingia adamsii* Carpenter, *Proc. Zool. Soc. London*, June 23, 1863, p. 367. Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, p. 203. Name proposed for *Cumingia*, sp. indet. c of C. B. Adams, *Ann. Lyceum Nat. Hist. New York*, Vol. 5, July, 1852, p. 512 (separate p. 288). "Near Panama."

*Cumingia moulinsii* De Folin, *Les Méléagrines* (Havre), 1867, p. 16, pl. 2, figs. 12, 13, 14, 15. . . "l'Océan pacifique" . . . "pêchées aux environs des Negritos" . . . or . . . "autour des îles aux Perles, dans la baie de Panama".—De Folin & Périer, *Les Fonds de la Mer*, Vol. 1, 1867, p. 8. Bay of Panama. [For dates of publication of this work see H. A. Rehder, *Proc. Malacol. Soc. London*, Vol. 27, Pt. 2, September 5, 1946, pp. 74-75].

*Type Locality*: Paita, Peru, at low water, in hard clay (here designated as type locality). Panama, in deep water, also cited originally.

*Range*: San Martin Island, Lower California, to the Gulf of California and south to Paita, Peru.

*Collecting Stations*: Mexico: Port Guatulo (195-D-9), 7 fathoms, gr. sand, crushed shell; Nicaragua: Corinto (200-D-10, 16, 17, 19), 4-13 fathoms, mangrove leaves, sand, also on shore; Costa Rica: Port Parker.

*Description*: Shell oblong, regularly concentrically laminated, laminae narrow, standing out, distant; anterior side short, rounded; posterior side angular, acuminate, substrated; ventral margin contracted near the end; dorsal margin sloped (Sowerby, *Conch. Icon.*, Vol. 19).

Some of the larger specimens in the present collection are about 12 mm. in length. Some specimens attain a length of 20 mm. or more.

*Cumingia lamellosa* lives in sand, sponges and in fissures in rocks. Consequently it

shows great variation in the shape of the shell and in the development of the lamellae. This variation has led to the publication of a number of different names for this species by various authors.

The more northern *Cumingia californica* Conrad, has a larger and thicker shell. *Cumingia similis* A. Adams is a synonym of Conrad's species.

*Cumingia mutica* Sowerby<sup>29</sup>, which occurs in Peru and Chile, possesses a large shell for the genus. It is ornamented by finely decussated sculpture. *Cumingia clerii* A. Adams<sup>30</sup>, *C. grandis* Deshayes<sup>31</sup>, *C. striata* A. Adams<sup>32</sup> and *C. ventricosa* Sowerby<sup>33</sup> were referred to the synonymy of *C. mutica* by Dall.

*Cumingia lamellosa* Sowerby is not to be confused with *Thyella lamellosa* H. Adams, 1885, described from the island of Mauritius, later renamed *Cumingia elegans* by Sowerby, 1873.

*Cumingia tellinoides* Conrad, 1831, *C. tellinoides coarctata* Sowerby, 1833, and *C. tellinoides vanhyningi* Rehder, 1939, occur in east American waters.

*Distribution*: Specimens of *Cumingia lamellosa* were taken by the expedition off western Mexico, Nicaragua and Costa Rica. Specimens questionably identified as this species have been recorded as occurring in the Pleistocene of Magdalena Bay, Lower California.

#### FAMILY DONACIDAE.

##### KEY TO THE GENERA OF THE DONACIDAE.

- A. Inner margin crenulated.....*Donax*  
 B. Inner margin smooth.....*Iphigenia*

#### Genus *Donax* Linnaeus.

##### KEY TO THE SPECIES OF *Donax*.

- A. Shell more than twice as long as high  
 a. Anterior dorsal margin concave  
     *transversus*  
 aa. Anterior dorsal margin straight or convex  
 b. Posterior dorsal area flattened or rounded  
 c. Shell flattened; very elongate  
     *gracilis*

<sup>29</sup> *Cumingia mutica* Sowerby, *Proc. Zool. Soc. London*, May 17, 1833, p. 34. "Hab. prope littora Maris Pacifici." Obtained "at Conception in seven fathoms, sand and mud; at Iquiqui in nine fathoms, gravel and mud; at Payta in hard clay at low water; and at Muerte."—Sowerby, *Conch. Icon.*, Vol. 19, *Cumingia*, 1873, species 3, pl. 1, fig. 3. "Hab. Chili, Peru."

<sup>30</sup> *Cumingia clerii* A. Adams, *Proc. Zool. Soc. London*, November 12, 1850, p. 24, pl. 8, fig. 3. "Found at Talcahuano, Chili, by Capt. Cleri, French Marine, attached to fuel in shallow water. (Mus. Cum.)"—Sowerby, *Conch. Icon.*, Vol. 19, *Cumingia*, 1873, species 2, pl. 1, fig. 2. "Hab. Chili."

<sup>31</sup> *Cumingia grandis* Deshayes, *Journ. de Conchyl.*, Vol. 5, 1857, p. 281, pl. 8, figs. 4 and 5. . . . "provient des mers du Chili."—Sowerby, *Conch. Icon.*, Vol. 19, *Cumingia*, 1873, species 11, pl. 2, fig. 11. "Hab. Chili."

<sup>32</sup> *Cumingia striata* A. Adams, *Proc. Zool. Soc. London*, November 12, 1850, p. 25, pl. 8, fig. 5. "Hab. Conception; seven fathoms, sandy mud; H. C. (Mus. Cuming)."

<sup>33</sup> *Cumingia ventricosa* Sowerby, *Conch. Icon.*, Vol. 19, August, 1873, species 10, pl. 2, fig. 10. "Hab. Probably Chili."

- cc. Shell moderately inflated; higher .....*californicus*  
 bb. Posterior dorsal area concave; posterior area smoky-black; shell sub-rhomboidal .....*navicula*  
 B. Shell less than twice as long as high  
 a. Shell with a sharply angled umbonal carina posteriorly  
 b. Thin; anterior end acutely rounded; highly polished.....*carinatus*  
 bb. Thick; anterior end more broadly rounded .....*rostratus*<sup>34</sup>  
 aa. Shell with a rounded umbonal angulation posteriorly; strongly sculptured  
 c. Interspaces punctate (with a row of fine pits)  
 d. Shell subtriangular (typical), high; posterior margin sloping rather steeply; ventral margin sometimes slightly expanded medially  
     *punctatostratus*  
 dd. Shell elongate, lower; flatter; posterior margin sloping more gently, posterior end rostrate; base more broadly rounded  
 e. Moderately elongated  
     *contusus*<sup>34</sup>  
 ee. Extremely elongated; posterior dorsal margin somewhat rounded  
     *culter*<sup>34</sup>

- cc. Interspaces not punctate  
 f. Length not exceeding 15 mm.; sculpture finely cancellate  
     *obesus*  
 ff. Length exceeding 15 mm.; sculpture coarsely cancellate; thick  
 g. Beaks subcentral; shell high, trigonal  
 h. Ribs on posterior area of about equal size .....*asper*  
 hh. Ribs on posterior area with 1-3 coarser than the others  
     *dentiferus*<sup>34</sup>  
 gg. Beaks decidedly posterior; shell more elongated  
     *assimilis*

#### *Donax asper* Hanley.

*Donax asper* Hanley, *Proc. Zool. Soc. London*, Pt. 13, April, 1845, p. 14. "Hab. Tumbes, Peru (Cuming)."—Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 12, pl. 2,

<sup>34</sup> Not represented in the present collection.

fig. 12. Original locality record cited.—Sowerby, *Thes. Conch.*, Vol. 3, 1866, p. 307, pl. 280 (*Donax*, pl. 1), fig. 24. Tumbez, Peru.

*Donax (Hecuba) asper* Hanley, Römer, *Syst. Conchyl.-Cab. Martini-Chemnitz*, Bd. 10, Abt. 3, *Donacidae*, 1869, p. 14, Tab. 3, figs. 7-10. Tumbez, Peru; Puntarenas, Costa Rica, in the Gulf of Nicoya.

*Donax aspera* Hanley, Dall, *Proc. U. S. Nat. Mus.*, Vol. 37, 1909, pp. 159, 273, pl. 28, fig. 7. Central America to Tumbez, Peru.

*Type Locality*: Tumbez, Peru.

*Range*: Tangola-Tangola Bay, Mexico, to Tumbez, Peru.

*Collecting Stations*: Mexico: Tangola-Tangola Bay; Costa Rica: Port Culebra, beach; Culebra Bay; Cedro Island, Gulf of Nicoya, beach; Gulf of Dulce, beach; Panama: Bahía Honda.

*Description*: Shell triangular, beaks sub-central, elevated, and rather gibbous; the anterior end is rather acutely rounded, the posterior end somewhat concavely truncated; ornamented by radiating riblets which are especially well developed toward the posterior end and on the posterior area where they are crenated by concentric lines; inner margin crenulated; the color is ashy-white or purple.

A large right valve in the present collection from the Gulf of Dulce measures, approximately: length, 35 mm.; height, 26 mm.; convexity (one valve), 8.5 mm.

Compared to *Donax assimilis* Hanley, the shell of *D. asper* is much higher in proportion to the length and the beaks are much more centrally located. The shell of *D. asper* differs from that of *D. dentiferus* Hanley<sup>35</sup> in that it is thicker, more acutely rounded anteriorly and lacks the raised ribs (1-3) which are coarser than the others on the posterior area of that species.

*Distribution*: This species was collected by the expedition from Mexico to Panama but nowhere in large numbers. Several single valves were taken on the beach in the Gulf of Dulce, Costa Rica, and at Tangola-Tangola Bay, Mexico.

#### *Donax assimilis* Hanley.

*Donax assimilis* Hanley, *Proc. Zool. Soc. London*, Pt. 13, April, 1845, p. 17. "Hab. Panama. Mus. Cuming, Hanley, &c."—Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 10, pl. 2, fig. 10. Panama.

*Donax panamensis* Philippi, *Zeit. f. Malakozool.*, Jahrg. 5, No. 10, 1848, p. 145. "Patria: Panama." [According to Römer, 1869, this species is a synonym of *D. assimilis*.]

*Donax cayennensis* Lamarck, Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 22, pl. 4, figs. 22a, 22b. "Hab. Panama and St. Elena, West Columbia; Cuming."

Not *Donax caianensis* Lamarck, *Anim. S. Vert.*, Vol. 5, July, 1818, p. 550. "Habite

l'Océan de la Guyane."—Delessert, *Rec. Coq. décrites par Lamarck et non encore figurées*, 1841, pl. 6, figs. 13a, 13b. See also Hanley, *Cat. Rec. Biv. Shells*, 1843, p. 82, footnote.—Lamy, *Bull. Mus. Nat. Hist. Nat.* (Paris), Vol. 20, No. 6, 1914, p. 339.

*Donax reevei* Bertin, *Nouv. Arch. Mus. Hist. Nat.* (Paris), Ser. 2, Vol. 4, 1881, p. 85. [Name based upon Reeve's pl. 2, fig. 10. Panama (Reeve).]

*Donax sowerbyi* Bertin, *Nouv. Arch. Mus. Hist. Nat.* (Paris), Ser. 2, Vol. 4, 1881, p. 85, pl. 4, figs. 2a, 2b, 2c. Based upon Sowerby's (*Thes. Conch.*, Vol. 3, 1866, p. 307), pl. 280 (*Donax*, pl. 1), fig. 21. "Panama."

*Type Locality*: Panama.

*Range*: Mazatlan, Mexico (Carpenter), to Santa Elena, Ecuador.

*Collecting Stations*: Nicaragua: Isla Encantada, Corinto; Costa Rica: Culebra Bay; Cedro Island, Gulf of Nicoya, beach; Gulf of Dulce, beach; Panama: Isla Parida, Gulf of Chiriqui.

*Description*: Shell elongately triangular, beaks posterior to the middle, anterior end the narrower, rounded, posterior end truncated; ornamented with radial riblets which are stronger toward the posterior end and on the posterior area which sometimes bears a faint subangulation; inner margin crenated; color, usually some shade or combination of gray and purple.

A large specimen of this species in the collection of the California Academy of Sciences, collected by James Zetek at Chame Island, Panama, measures: length, 41 mm.; height, 26.8 mm.; convexity (both valves together), 17.5 mm.

Compared to *Donax asper* the shell of *D. assimilis* is much more elongate, the beaks are more posteriorly situated and the posterior area is more rounded. The more posteriorly situated beaks and more elongated shell are characters which serve to separate the present species from *D. dentiferus*.

*Distribution*: This species was taken by the expedition on the beach at a few localities from Nicaragua to Panama. It occurs commonly at Panama where it is used for food by the natives.

#### *Donax californicus* Conrad.

Plate I, Figs. 2, 5.

*D[onax]. californica* Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Vol. 7, 1837, p. 254, pl. 19, fig. 21. "Inhabits the coast of California in sand, near Sta. Barbara."

Not *Donax californica* Conrad, Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 40, pl. 6, fig. 40. "Hab. Gulf of California." [Carpenter, 1855, referring to some of the shells in the Gulf of California region labeled as *D. californicus*, stated, "The shells wrongly called *D. californicus* are simply the white variety of the forms *contusus* and *culter*"].

*Donax californicus* Conrad, Arnold, *Mem. Calif. Acad. Sci.*, Vol. 3, 1903, p. 170, pl. 13,

<sup>35</sup> *Donax dentifera* Hanley, *Proc. Zool. Soc. London*, Pt. 11, July, 1843, p. 6. "Hab. ?"—Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 2, pl. 1, figs. 2a, 2b. "Hab. Panama."

fig. 9. Lower San Pedro Series at Deadman Island, and San Pedro, California. Lower Pleistocene. Also upper Pleistocene and Recent.—Weymouth, State of Calif. Fish & Game Comm., *Fish Bull.* No. 4, 1920, p. 47, pl. 16, fig. 1. Localities cited from San Pedro to False Bay, California.

*Type Locality:* Near Santa Barbara, California, in sand.

*Range:* Santa Barbara, California, to Magdalena Bay, Lower California.

*Collecting Station:* Mexico: Cedros Island, Lower California.

*Description:* Shell elongated, somewhat pointed at both extremities; disks with very minute radiating lines; color yellowish, obscurely rayed; a brown stripe on the anterior and posterior sub-margin; within white and purplish brown; margin beautifully crenulated. (Original description.)

A specimen of this species in the collections of the California Academy of Sciences, collected by Henry Hemphill at Cape San Lazaro, Lower California, measures: length, 24.6 mm.; height, 11 mm.; convexity (both valves together), 7.4 mm.; from beaks to posterior end, 10 mm. Large specimens attain a length of about 30 mm.

*Donax californicus* can be referred to the subgenus *Serrula* Chemnitz in Mörch.

The posterior dorsal area of the shell of this species is flattened or gently rounded rather than concave as in *D. navicula*.

*Donax gracilis* Hanley is a similar southern species whose shell is more elongated and whose posterior dorsal margin slopes more gently ventrally.

*Distribution:* A few small specimens of *Donax californicus* were dredged off Cedros Island by the expedition. We have not seen specimens from south of Cape San Lazaro, Lower California<sup>36</sup>. It is also known to occur in the Pleistocene of southern California and western Lower California.

### *Donax carinatus* Hanley.

Plate I, Fig. 9.

*Donax carinata* Hanley, *Proc. Zool. Soc. London*, Pt. 11, July, 1843, p. 5. "Hab. —? Mus Stainforth, Metcalfe."—Hanley, *Cat. Rec. Bivalve Shells*, p. 84, 1843, p. 349, pl. 14, fig. 28, 1856 (as *Donax carinatus* on expl. to plate). [No locality cited.]—Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 11, pl. 2, fig. 11. "Hab. San Blas, California."

*Donax carinatus* Hanley, Sowerby, *Thes. Conch.*, Vol. 3, 1866, p. 305, pl. 280 (*Donax*, pl. 1), figs. 4 and 5. "California."—Römer, *Syst. Conchyl.-Cab. Martini-Chemnitz*, Bd. 10, Abt. 3, *Donacidae*, 1869, p. 10, Taf. 3, figs. 4, 5, 6. "Fundort: Der Stille Ocean bei Californien, (St. Blas, Tumaco, Mazatlan)."

*Donax culminatus* Carpenter, *Cat. Mazat-*

lan Shells, September, 1855, p. 43. "Hab. — 1 young specimen; L'pool Col."

*Type Locality:* San Blas, Mexico (here designated as type locality). No locality cited originally.

*Range:* Altata, Mexico, to Tumaco, Colombia.

*Collecting Station:* Nicaragua: Corinto (200-D-16, 19), 4-13 fathoms, mangrove leaves.

*Description:* Transversely elongated, convex, very inequilateral, purplish-brown, with more or less distinct radiating striae, (usually with obsolete darker rays and polished), ventral edge little arcuated and forming a very acute point with the nearly straight edge of the obliquely truncated and almost flattened anterior [posterior] slope, which is sharply carinated and sculptured by close decussated radiating striae: inside purple, two lateral teeth in each valve, the ventral edge crenated, anterior crenulated. 4/5 . . . 1 2/5 [inches] (Hanley, *Cat. Rec. Biv. Shells*, 1843).

The largest specimen in the present collection measures 33.2 mm. in length and 18 mm. in height. A large right valve collected by the senior author at Corinto, Nicaragua, measures approximately: length, 39.4 mm.; height, 22 mm.; convexity (one valve), 7.6 mm.

This species can be easily recognized by the comparatively thin, polished shell with a sharply angled umbonal ridge posteriorly.

The only other west American shell that might be confused with *Donax carinatus* is *Donax rostratus* C. B. Adams<sup>37</sup>. The shell of Adams' species is thicker, less sharply carinated, and is less sharply pointed where the carina joins the ventral margin, the anterior end is more broadly rounded, and the color of the exterior is lighter.

A subspecies, *Donax carinatus galvestonensis* Harris<sup>38</sup>, has been described from an artesian well in Galveston, Texas, and was considered to be of upper Miocene age. Harris did not consider Reeve's plate 2, figure 11, as representing Hanley's species.

*Distribution:* This species was dredged by the expedition off Corinto, Nicaragua, at depths of 4-13 fathoms. It also has been collected by the senior author at Corinto and at Mazatlan, Mexico. Römer cited the occurrence of the species as far south as Tumaco, Colombia.

### *Donax gracilis* Hanley.

Plate I, Figs. 4, 6.

*Donax gracilis* Hanley, *Proc. Zool. Soc. London*, Pt. 13, April, 1845, p. 15. "Hab. Bay of Guayaquil. Var. *b.* Chiriqui. Var. *c.* Bay of Caraccas (Cuming)."—Reeve, *Conch.*

<sup>37</sup> *Donax rostratus* C. B. Adams, *Ann. Lyceum Nat. Hist. New York*, Vol. 5, July, 1852, p. 545 (separate pp. 278, 321). "Panama."—Römer, *Syst. Conchyl.-Cab. Martini-Chemnitz*, Bd. 10, Abt. 3, *Donacidae*, 1869, p. 11, Taf. 3, figs. 1-3.

<sup>38</sup> *Donax carinata* var. *galvestonensis* Harris, *Bull. Amer. Paleol.*, Vol. 1, No. 3, December 2, 1895, p. 92 (10). Well at Galveston, Texas, depth, 2,552 to 2,920 feet. Upper Miocene.

<sup>36</sup> According to Miss Viola Bristol, specimens of this species from Magdalena Bay, Lower California, are in the collections of the San Diego Society of Natural History (*Min. Conch. Club South. Calif.*, No. 47, back page, April, 1945). On the same page of this paper Eyerdam is cited as having found this species at Corinto, Nicaragua.

Icon., Vol. 8, *Donax*, September, 1854, species 38, pl. 6, fig. 38. "Hab. Gulf of Guayaquil; Cuming."—Sowerby, Thes. Conch., Vol. 3, 1866, p. 314, pl. 282 (*Donax*, pl. 3), figs. 76, 77, 78, 79. Gulf of Guayaquil.—Römer, Syst. Conchyl.-Cab. Martini-Chemnitz, Bd. 10, Abt. 3, *Donacidae*, 1869, p. 80, Taf. 14, figs. 4, 5, 6. [?7, 8]. "Fundort: Der Stille Ocean bei Mittelamerika und Ecuador, (Guayaquil, Chiriqui, Panama)."

*Type Locality*: Bay of Guayaquil, Ecuador (here selected as type locality). Chiriqui [Panama] and Bay of Caraccas [Ecuador] also cited originally for varieties of this species.

*Range*: Lat. 24° 18' N., west coast of Lower California, to the Gulf of California and south to Negritos, Peru.

*Collecting Station*: Nicaragua: Corinto (200-D-10, 11, 16, 17, 19), 7-13 fathoms, sand, mangrove leaves, also in beach drift.

*Description*: Shell narrowly elongate, polished, rather compressed, beaks nearer the posterior end; anterior end acutely rounded, posterior end acutely roundly pointed; posterior dorsal margin straight or slightly produced; inner margin finely crenulated; color of the exterior is usually brown and that of the interior brownish-purple.

A large left valve from off Potosi and Monypenny Point, Nicaragua, measures approximately: length, 22.5 mm.; height, 9.4 mm.; convexity (one valve), 3 mm.; distance from beak to posterior end, 9 mm.

The shell of *Donax gracilis* differs from that of *D. navicula* in the much more elongate outline and in that the posterior dorsal margin is straight or slightly produced rather than concave. Compared to *D. californicus* the shell of *D. gracilis* is longer in proportion to the height, more compressed, the posterior dorsal margin slopes more gently and the posterior end is more acutely pointed. It can be referred to the subgenus *Serrula*.

*Donax punaensis* Pilsbry & Olsson<sup>39</sup>, described from the Pliocene of Ecuador, is a very similar species but the beaks appear to be more centrally situated and the posterior end is more broadly rounded.

*Donax petersoni* Olsson, described from the Oligocene of Peru, is a somewhat similar species.

*Donax owenii* Gray in Hanley<sup>40</sup> of the Atlantic fauna appears to be somewhat similar to *D. gracilis* but the posterior end appears

<sup>39</sup> *Donax punaensis* Pilsbry & Olsson, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 93, September 9, 1941, p. 72, pl. 12, fig. 2. "Pliocene of the north end of Puna Island." Ecuador.

<sup>40</sup> *Donax owenii* Gray in Hanley, *Cat. Rec. Bivalve Shells*, 1843, p. 81. "Africa?"—Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 37, pl. 6, fig. 37. "Hab. West Coast of Africa."

Dall (*Nautilus*, Vol. 5, No. 4, August, 1891, p. 44), recorded this species from Montevideo and Maldonado. Maury (*Serv. Geol. & Min. Brasil*, Mon. No. 4, 1924, p. 455) also cited the species as occurring at Montevideo, Uruguay. Melvill & Standen recorded a species under the name of *Donax (Machaerodonax) owenii* Gray, from Karachi, India (*Proc. Zool. Soc. London*, November 13, 1906, p. 826). Carcelles recently cited *Donax owenii* as occurring along the coast of Argentina (*Rev. Mus. de La Plata (New Ser.)*, Sec. Zool., Vol. 3, 1944, p. 303).

to be shorter and the margin is said to be smooth not crenulated.

*Distribution*: Specimens of *Donax gracilis* were taken by the expedition in the beach drift as well as dredged in 7 to 13 fathoms at Corinto, Nicaragua.

#### *Donax navicula* Hanley.

Plate I, Fig. 1.

*Donax navicula* Hanley, *Proc. Zool. Soc. London*, Pt. 13, April, 1845, p. 15. "Hab. Gulf of Nicoya, Central America (Cuming)".—Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 18, pl. 4, fig. 18. Original locality cited.—Sowerby, Thes. Conch., Vol. 3, 1866, p. 314, pl. 282 (*Donax*, pl. 3), fig. 80. Original locality cited.—Römer, Syst. Conchyl.-Cab. Martini-Chemnitz, Bd. 10, Abt. 3, *Donacidae*, 1869, p. 56, Taf. 10, figs. 1-3. "Fundort: Der Stille Ocean bei Californien und Mittelamerika, (Nicoyia, Panama, Mazatlan, Reallejos)."

*Type Locality*: Gulf of Nicoya, Costa Rica.

*Range*: Gulf of California to Panama.

*Collecting Stations*: Mexico: Santa Inez Bay, Gulf of California; Cape San Lucas; Cape San Lucas Bay; Nicaragua: Potosi and Monypenny Point, Gulf of Fonseca; Corinto (200-D-10, 16), 4-7 fathoms, mangrove leaves, also in beach drift.

*Description*: Shell elongately rhomboidal, moderately inflated, fairly thick, obsolete, finely radially grooved; anterior end the longer, acutely rounded, posterior end acuminate truncated, the extremity roundly pointed; posterior area concave; ventral margin rounded and somewhat expanded just anterior to the middle, often with a compressed area between this portion of the valve and the posterior angulation; inner margin crenulated; color white or brownish with the posterior and anterior dorsal areas black or grayish-black; periostracum greenish.

One of the largest specimens, a right valve, from the beach drift at Corinto, Nicaragua, measures approximately: length, 21 mm.; height, 10 mm.; convexity (one valve), 3.9 mm.; distance from beaks to posterior end, 8.5 mm.

The shell of *Donax navicula* differs from that of *D. gracilis* in the more rounded base and rhomboidal form, more inflated valves and especially in that the posterior area is concave. It can be referred to the subgenus *Serrula*.

The concave posterior area and higher more triangular form are features which serve to separate *Donax navicula* from *D. californicus*.

*Distribution*: This species was taken abundantly by the expedition in the beach drift at Corinto, Nicaragua. A few specimens were also taken as far north as Santa Inez Bay in the Gulf of California.

#### *Donax obesus* d'Orbigny.

Plate I, Fig. 7.

*Donax obesa* d'Orbigny, Voy, Amér.



Mérid., Vol. 5, 1846, p. 541, pl. 81, figs. 28, 30. "Elle a été pêchée à Payta (Pérou) par M. Fontaine."—Reeve, Conch. Icon., Vol. 8, *Donax*, October, 1854, species 49, pl. 7, fig. 49. "Hab. Real Llejos, Central America; Cuming."

*Donax obesus* d'Orbigny, Sowerby, Thes. Conch., Vol. 3, 1866, p. 310, pl. 281 (*Donax*, pl. 2), figs. 42, 43. "Real Llejos, Central America."

*Type Locality*: Paita, Peru.

*Range*: Corinto, Nicaragua, to Paita, Peru.

*Collecting Station*: Nicaragua: Corinto (200-D-11, 19), 8-13 fathoms, mangrove leaves.

*Description*: Shell small, subtriangular, inflated; the anterior end the longer, sloping, acutely rounded at the extremity, posterior end broadly and roundly truncated; umbonal ridges rounded; ornamented with fine radial grooves which are crossed by somewhat flexuous concentric grooves forming a fine cancellated pattern of punctate appearance; inner margin finely crenulated; color white with dark purplish-brown on the posterior end and on the anterior dorsal margin.

The largest specimen in the collection, a right valve, measures: length, 13.4 mm.; height, 10.9 mm.; convexity (one valve), 4.2 mm.

The shell of *Donax obesulus* Reeve<sup>41</sup> is much more abruptly truncated than that of *D. obesus*, and the posterior umbonal ridge is decidedly angulated rather than rounded.

*Distribution*: This species was dredged by the expedition at two localities off Corinto, Nicaragua, at depths of 8-13 fathoms.

#### *Donax punctato-striatus* Hanley.

Plate I, Fig. 17.

*Donax punctato-striata* Hanley, *Proc. Zool. Soc. London*, Pt. 11, July, 1843, p. 5. "Hab.—? Mus. Stainforth, Metcalfe, Hanley, &c."—Hanley, *Cat. Rec. Biv. Shells*, 1843, p. 84, pl. 14, fig. 24 (as *Donax punctato-striatus* on expl. to plate). [Not the record "China"].—Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 16, pl. 3, figs. 16a, 16b. "Hab. Mazatlan, Gulf of California."—Sowerby, *Thes. Conch.*, Vol. 3, *Donax*, 1866, p. 310, pl. 281 (*Donax*, pl. 2), figs. 49, 50 (as *Donax punctato-striatus*). Reeve's locality cited on expl. to pl.

*Type Locality*: Mazatlan, Mexico (here designated as type locality). No locality cited originally.

*Range*: San Ignacio Lagoon, Lower California, to the Gulf of California and south to Negritos, Peru.

*Collecting Stations*: Mexico: Santa Inez Bay, Gulf of California; Cape San Lucas; Chamela Bay; Tenacatita Bay; Sihuatanejo;

Tangola-Tangola Bay; Nicaragua: Gulf of Fonseca; Potosi and Monypenny Point; Corinto (200-D-19), 12-13 fathoms, mangrove leaves, also beach.

*Description*: Subtriangular, very convex, pale livid brown, with strong radiating punctated striae, becoming very fine and close on the anterior [posterior] slope, whose edge is rounded, posterior and anterior edges much sloping, ventral arcuated in the middle; inside stained with violet, the ventral margins dentated, the anterior [posterior] crenulated: two cardinal and lateral teeth in each valve. Long.  $4/5$ — $1-1/5$  [inches] (Hanley, *Cat. Rec. Biv. Shells*, 1843). "When full grown less inequilateral than most of this genus."

A very large specimen of this species in the Henry Hemphill collection in the California Academy of Sciences, collected at Magdalena Bay, Lower California, measures: length, 44.8 mm.; height, 30 mm.; convexity (both valves together), 17.4 mm.

The subtrigonal form and the row of fine pits, which occur in the radial grooved striae, are characteristic features of this species. It belongs to the subgenus *Chion* Scopoli.

Hanley once reported *Donax punctato-striatus* from China but it was later recognized as occurring commonly in tropical west American waters.

The variety described by Carpenter as *Donax punctato-striatus* var. *caelatus*<sup>42</sup> appears not to have been recognized since its description. It was described as possessing short impressed lines rather than pits in the interspaces.

Sowerby (1866) pointed out that there are specimens which intergrade between *Donax punctato-striatus* and *Donax conradi* Reeve<sup>43</sup>. The latter species is now known to be identical with *D. contusus* Reeve<sup>44</sup> (see our Pl. I, fig. 14), as pointed out by Tomlin<sup>45</sup>. *Donax vellicata* Reeve (fig. 66) and *D. bitincta* Reeve (fig. 68), both described without information as to the locality from which they came, are likewise identical with *D. contusus* according to Tomlin.

Typical forms of *Donax punctato-striatus* are more subtrigonal and higher than those of typical *D. contusus*, which are lower and more elongate in outline. Large specimens of *D. punctato-striatus* are sometimes slightly expanded medially along the ventral margin and the posterior dorsal margin often slopes more steeply than that on *D. contusus*, but as mentioned by Sowerby, there is intergradation between the two forms. The most elongate form of this variable group is *Donax*

<sup>42</sup> *Donax* ?*punctato-striatus*, var. *caelatus* Carpenter, *Cat. Mazatlan Shells*, September, 1855, p. 46. "Hab.—Mazatlan; very rare."

<sup>43</sup> *Donax conradi* Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 29, pl. 5, fig. 29. "Hab. Gulf of California."

<sup>44</sup> *Donax contusus* Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 24, pl. 4, fig. 24. "Hab. Mazatlan, Gulf of California."

<sup>45</sup> Tomlin, J. R. leB., *Nautilus*, Vol. 40, No. 2, October, 1926, p. 52.

<sup>41</sup> *Donax obesulus* Reeve, *Conch. Icon.*, Vol. 8, *Donax*, September, 1854, species 30, pl. 5, fig. 30. "Hab. Peru."—Deshayes, *Proc. Zool. Soc. London*, 1854 (issued May 16, 1855), p. 352. "Hab. Central America."

*culter* Hanley<sup>46</sup>, as pointed out by Carpenter<sup>47</sup>. Very elongate forms of *D. culter* are somewhat reminiscent of *Amphichaena kindermanni* Philippi<sup>48</sup> as is *Donax petalinus* Reeve<sup>49</sup>.

*Donax aricanus* Dall<sup>50</sup>, recorded as occurring from Paita, Peru, to Arica, Chile, appears to be very similar to *D. punctatostratus* and possibly some of the records of the occurrence of the latter species in South America may be referable to Dall's species. Römer considered *D. radiatus* Valenciennes [= *aricanus*] to be only a variety of *D. punctatostratus*.

*Donax striatus* Linnaeus, which occurs in the Caribbean region, is a similar species.

**Distribution:** This species was collected by the expedition on the beach and dredged at depths of 12-13 fathoms, from Santa Inez Bay in the Gulf of California to Corinto, Nicaragua. It is a variable shell found commonly from the Gulf of California to Peru. It has been recorded as occurring in the Pleistocene of southern California, Magdalena Bay, Lower California, and at Oaxaca, Mexico.

#### *Donax transversus* Sowerby.

##### Plate I, Fig. 3.

*Donax transversa* Sowerby, Cat. Shells Tankerville, 1825, Ap., p. IV. [No locality cited].—Reeve, Conch. Icon., Vol. 8, *Donax*, September, 1854, species 36, pl. 6, fig. 36. "Hab.—?"

*Donax transversus* Sowerby, Sowerby, Thes. Conch., Vol. 3, 1866, p. 306, pl. 280 (*Donax*, pl. 1), fig. 11. "Hab.—?"—Carpenter, Cat. Mazatlan Shells, September, 1855, p. 44. Mazatlan, Mexico.

**Type Locality:** Corinto, Nicaragua (here designated as type locality). No locality cited originally.

**Range:** Mazatlan, Mexico, to San Juan del Sur, Nicaragua.

**Collecting Station:** Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves.

**Description:** "D. testâ transversim elongatâ, laevi; latere postico brevi, biangulato, carinato, obliquè truncato, longitudinaliter sulcato; extus albidâ; fulvo obsoletè radiatâ". (Original description).

The shell of this species is very elongated, very inequilateral, rather thin, moderately inflated, gaping at each end, polished and obsoletely radially striated; anterior dorsal margin slightly concave; anterior end elliptically rounded obliquely joining the slightly rounded ventral margin; posterior end truncated, set off by a carina, the area fairly broad, concave, with a faint rounded angulation medially, the whole area finely radially striated and at the end obliquely truncated; color yellowish-white with purple rays; ventral margin finely crenated.

Specimens of this species in the present collection are small. A large left valve collected at Corinto, Nicaragua, by the senior author measures: length, 36.4 mm.; height, 14.5 mm.; convexity (one valve), 4.5 mm.; distance from beak to posterior end, 14 mm.

This appears to be the species which authors have cited from western Mexico and Central America under the name of *Donax scalpellum* Gray. *Donax scalpellum* Gray<sup>51</sup> was originally described without information as to locality. Hanley<sup>52</sup> later cited it from "California" and Reeve<sup>53</sup> cited it from the Gulf of California. E. A. Smith<sup>54</sup> in 1891 cited it from Aden, in the Gulf of Aden, and stated: "The above named locality, given by Reeve (Conch. Icon. sp. 39), has never been confirmed, and I think there is little doubt that it is incorrect. The specimens from Aden agree in form, color, sculpture, and every other respect with that figured by Reeve." Later Melvill & Standen<sup>55</sup> cited the species as occurring at Karachi, India, in the Arabian Sea.

The concavity of the anterior dorsal margin, obliquely elliptically rounded anterior end, and much wider and radially striated posterior area are features separating *Donax transversus* from *D. scalpellum*. *Donax transversus* belongs to the subgenus *Machaeodonax* Römer, the type of which is *D. scalpellum* Gray.

**Distribution:** Three small specimens of *Donax transversus* were dredged by the expedition in 12-13 fathoms off Corinto, Nicaragua. It also has been collected by the senior author on the beach at the same locality.

<sup>46</sup> *Donax culter* Hanley, Proc. Zool. Soc. London, April, 1845, p. 14. "Hab. Var. a. Matzellan [Mazatlan] Gulf of California (Cuming). Var. b. Acapulco (Cuming)."—Reeve, Conch. Icon., Vol. 8, *Donax*, September, 1854, species 21, pl. 4, fig. 21. "Hab. Gulf of California."

<sup>47</sup> Carpenter, P. P., Cat. Mazatlan Shells, September, 1855, pp. 47-48.

<sup>48</sup> See Palmer, R. H., and Hertlein, L. G., Bull. South. Calif. Acad. Sci., Vol. 35, Pt. 2, May-August (issued September 10), 1936, p. 71, pl. 18, figs. A, B, C, pl. 19, figs. 5, 6, 7, 8, 9, 10. Mazatlan; Petatlan Bay; Tenacatita Bay, Mexico, Recent. Also Oaxaca, Mexico, Pleistocene.

<sup>49</sup> *Donax petalina* Reeve, Conch. Icon., Vol. 8, *Donax*, October, 1854, species 51, pl. 8, fig. 51. "Hab.—?"—Deshayes, Proc. Zool. Soc. London for 1854 (issued May 16, 1855), p. 350 (as *Donax petalina*). "Hab.—? Coll. Cuming."

This species was described without information as to the locality from which it came. Bertin (Nouv. Arch. Mus. Hist. Nat. (Paris), Ser. 2, Vol. 4, 1881, p. 84), stated that he found an indication in Deshayes' collection that the species came from Chile. Dall, 1909, and Gigoux, 1934, also cited it from that country. Pilsbry & Lowe, 1932, and Bales, 1938, cited it from Acapulco, Mexico.

<sup>50</sup> *Donax radiata* Valenciennes, Rec. d'Obser. Zool. Humboldt & Bonpland, Vol. 2, 1832, p. 221, pl. 1, figs. 3a, 3b, 3c, 4. "Habitat in Oceano Pacifico ad Americae calidioris litora." Not *Donax radiata* Gmelin, 1791.

*Donax aricana* Dall, Proc. U. S. Nat. Mus., Vol. 37, November 24, 1909, p. 273. New name for *Donax radiata* Valenciennes, 1832, not *D. radiata* Gmelin, 1791. Paita, Peru, to Arica, Chile.

<sup>51</sup> *Donax scalpellum* Gray, Ann. Philos., Vol. 25, February, 1823, p. 136. [No locality cited].—Wood, Index Test., Suppl., 1828, p. 4, pl. 2, *Donax*, fig. 1. [No locality cited].

<sup>52</sup> Index Test. by W. Wood, edit. by S. Hanley, 1856, p. 202, Suppl. pl. 2, *Donax* fig. 1. "California."

<sup>53</sup> Reeve, L. A., Conch. Icon., Vol. 8, *Donax*, September, 1854, species 39, pl. 6, fig. 39. "Hab. Gulf of California."

<sup>54</sup> Smith, E. A., Proc. Zool. Soc. London, 1891, p. 427.

<sup>55</sup> Melvill, J. C., and Standen, R., Proc. Zool. Soc. London, November 13, 1906, p. 826.—Melvill, Proc. Malacol. Soc. London, Vol. 18, Pt. 3, 1928, p. 115.

Genus *Iphigenia* Schumacher.

*Iphigenia* Schumacher, Essai Nouv. Syst. Test., 1817, pp. 51, 155. Sole species, *Iphigenia laevigata* (*Donax laevigata* Chemnitz.). Ref. to Chemnitz, Vol. 6, p. 253, pl. 25, fig. 249. Illustrated by Schumacher on pl. 17, figs. 4a, b.—Dall, *Trans. Wagner Free Inst. Sci.*, Vol. 3, Pt. 5, 1900, p. 962. Type: *Donax laevigata* Chemnitz.—Pilsbry & Bequaert, *Bull. Amer. Mus. Nat. Hist.*, Vol. 53, Art. 2, May 9, 1927, p. 369. *Donax laevigata* "Chemnitz" Gmelin accepted as type.

Type (by monotypy): *Donax laevigata* Chemnitz [Neues Syst. Conchyl.-Cab., Bd. 6, 1782, p. 253, Tab. 25, fig. 249. "Es wohnt diese Muschel in den ostindischen Meeren. Bey Tranqueber wird sie nur selten gefunden". Also illustrated by Schumacher, pl. 17, fig. 4a, b].

Shell large, subtriangular, subequilateral, without radial sculpture; thick, with entire ventral margins; two cardinals, the larger bifid, in each valve and two obsolete laterals in the right valve. (Dall).

The genus *Iphigenia* is known to occur in the Miocene of Venezuela and Peru. At the present time it often occurs in estuarine or brackish water conditions and is known to occur in greatest abundance from the coast and rivers of West Africa and from the tropical Atlantic and Pacific coasts of Central and South America. *Iphigenia centralis* Germain, an African species, ranges from the middle Niger river to strongly saline waters. One species occurs on the coast of Florida and one species occurs in tropical west American waters.

*Iphigenia altior* Sowerby.

*Capsa altior* Sowerby, *Proc. Zool. Soc. London*, Pt. 2, for 1832 (issued March 13, 1833,) p. 196. "Hab. in Peruvia et America Centrali." "Dredged among coarse gravel, in twelve fathoms water, in the Gulf of Nocoioy. A smaller variety, which is also rather higher, was found at Tumbez, at a depth of five fathoms, in thin mud."—Hanley, *Cat. Rec. Bivalve Shells*, p. 86, 1843, pl. 14, fig. 34, 1844, p. 349, 1856. Peru and Central America.—Römer, *Syst. Conchyl.-Cab. Martini-Chemnitz*, Bd. 10, Abt. 3, *Donacidae*, 1869, p. 114, Tab. 21, figs. 1-4. Earlier records cited.

*Iphigenia ambigua* Bertin, *Nouv. Arch. Mus. Hist. Nat.* (Paris), Ser. 2, Vol. 4, 1881, p. 120, pl. 4, figs. 4a, 4b, 4c . . . "habite l'océan Pacifique, sur les côtes de l'Amérique centrale."

*Iphigenia altior* Sowerby, Dall, *Proc. U. S. Nat. Mus.*, Vol. 37, 1909, p. 159, pl. 25, fig. 8. Capon to Tumbez, Peru. Range, Gulf of California to Tumbez, Peru.

Type Locality: Gulf of Nicoya, Costa Rica, in 12 fathoms, coarse gravel. Tumbez, Peru, also cited originally for a small variety of this species.

Range: Gulf of California to Tumbez, Peru.

Collecting Stations: Mexico: Chamela Bay, beach; Nicaragua: Potosi and Moneypenny Point; Corinto, beach; Costa Rica: Port Culebra; Culebra Bay; Golfito Bay; one mile south of Golfito Bay.

Description: Shell subtriangular, the anterior side the longer, thick, moderately inflated, base rounded, anterior dorsal margin gently arcuate and sloping, rounded at the end, posterior dorsal margin more steeply sloping, more flattened and subtruncated at the end, a slight depression often present anterior to the posterior umbonal ridge; smooth except for lines of growth and submicroscopic radiating striae; two cardinal teeth in each valve, the right posterior and left anterior bifid or medially grooved; inner margin smooth; pallial sinus extends for about five-eighths the length of the shell, rounded at the end, and along the base for about a third of its length confluent with the pallial line; color yellowish or purplish-white under an olive periostracum, the umbos dark, the interior white and violet.

A very large right valve in the present collection from one mile south of Golfito Bay, Costa Rica, measures: length, 79 mm.; height, 57.3 mm.; convexity (one valve), 18 mm.; pallial sinus extends anteriorly 45 mm. from the posterior margin of the shell. A specimen in the collection of the California Academy of Sciences collected in Panama Bay by F. M. Anderson, measures: length, 68 mm.; height, 51.5 mm.; convexity (both valves together), 31 mm.; pallial sinus extends anteriorly 39 mm. from the posterior margin of the shell.

The specimen described as *Iphigenia ambigua* by Bertin may be slightly longer in proportion to the height as compared to some specimens of *I. altior*. In the absence of any other differences and in view of the variation shown in a series of shells, we have placed Bertin's species in the synonymy of *I. altior*. Carpenter<sup>56</sup> mentioned an elongate specimen from Mazatlan with a strong posterior ventral sinus which he referred to "*Iphigenia ?laevigata, ?cujus*." According to Carpenter, Gray considered the specimen to be an abnormal variety of *I. altior*. In general features *I. altior* is quite similar to *I. laevigata*, the type of the genus, from West Africa.

Compared to *Iphigenia brasiliana* Lamarck, which occurs in the Caribbean region, the shell of *I. altior* is considerably higher proportionately from beak to base and it has a much fainter depression anterior to the posterior truncation.

Distribution: Specimens of *Iphigenia altior* were collected by the expedition on beaches from Chamela Bay, Mexico, to Golfito Bay, Costa Rica. Dall mentioned that this species was found at a depth of 4 to 6 inches in sand, on flats and tidal lagoons of Peru.

<sup>56</sup> Carpenter, P. P., *Cat. Mazatlan Shells*, September, 1855, p. 42.

## EXPLANATION OF THE PLATE.

- Fig. 1. *Donax navicula* Hanley. Hypotype, left valve, from Corinto, Nicaragua. Length, 18.8 mm.; height, 9.2 mm. P. 254.
- Fig. 2. *Donax californicus* Conrad. Hypotype, left valve, from San Pedro Bay, California. Length, 22 mm.; height, 9.8 mm. P. 252.
- Fig. 3. *Donax transversus* Sowerby. Hypotype, left valve, from Corinto, Nicaragua. Length, 36.6 mm.; height, 14.5 mm. P. 256.
- Fig. 4. *Donax gracilis* Hanley. Hypotype, left valve, from Potosi and 5 miles west of Monypenny Point, Nicaragua. Length, 22 mm.; height, 9.7 mm. P. 253.
- Fig. 5. *Donax californicus* Conrad. View of right valve of the specimen shown in Fig. 2.
- Fig. 6. *Donax gracilis* Hanley. Hypotype, left valve, from Loc. 27588 (C.A.S.), about 13 miles southeast of Cape Tosco, Santa Margarita Island, west coast of Lower California. Collected by the Templeton Crocker Expedition, 1932. Length, 15.8 mm.; height, 7.3 mm. P. 253.
- Fig. 7. *Donax obesus* d'Orbigny. Hypotype, left valve, from Station 200-D-19, Lat. 12° 28' 03" N., Long. 87° 12' 39" W., Corinto, Nicaragua, in 12-13 fathoms (22-24 meters). Length, 11.1 mm.; height, 8.9 mm. P. 254.
- Fig. 8. *Semele sparsilineata* Dall. Hypotype, left valve, from Station 221-D-1, Lat. 7° 54' 45" N., Long. 82° 04' 32" W., Gulf of Chiriqui, Panama, in 35 fathoms (64 meters). Length, 22 mm.; height, 17.4 mm. P. 247.
- Fig. 9. *Donax carinatus* Hanley. Hypotype, left valve, from Corinto, Nicaragua. L. G. Hertlein, coll. Length, 36.3 mm.; height, 18.2 mm. P. 253.
- Fig. 10. *Semele quentinensis* Dall. Hypotype, right valve, from Station 199-D-1, Lat. 13° 08' N., Long. 87° 43' W., Meanguera Island, Gulf of Fonseca, El Salvador, in 16 fathoms (29 meters). Length, 26.4 mm.; height, 21.1 mm. P. 246.
- Fig. 11. *Semele pacifica* Dall. Hypotype, right valve, from Golfito, Gulf of Dulce, Costa Rica. Length, 19.4 mm.; height, 15.4 mm.
- Fig. 12. *Semele jaramija* Pilsbry & Olsson. Hypotype, left valve, from Santa Inez Bay, Lower California, in the Gulf of California, on shore. Length, 16.1 mm.; height, 12 mm. P. 244.
- Fig. 13. *Semele venusta* Reeve. Hypotype, right valve, from Station 196-D-8, Lat. 15° 45' 37" N., Long. 96° 05' 54" W., Tangola-Tangola Bay, Mexico, in 9 fathoms (16.3 meters). Length, 17.8 mm.; height, 13 mm. P. 248.
- Fig. 14. *Donax contusus* Reeve. Hypotype, left valve, from Loc. 27230 (C.A.S.), Petatlan Bay, Mexico, about 6 miles south of Sihuatanejo. L. G. Hertlein, coll. Length, 39.1 mm.; height, 20 mm. (Illustrated for comparison with *Donax punctatostriatus*, Fig. 17). P. 255. (in text).
- Fig. 15. *Semele pulchra* Sowerby. Hypotype, right valve, from Potosi and 5 miles SSW. of Monypenny Point, Nicaragua. Length, 31 mm.; height, 26 mm. P. 246.
- Fig. 16. *Abra palmeri* Dall. Hypotype, right valve, from Station 199-D-1, Lat. 13° 08' N., Long. 87° 43' W., Meanguera Island, Gulf of Fonseca, El Salvador, in 16 fathoms (29 meters). Length, 9.8 mm.; height, 9 mm. P. 250.
- Fig. 17. *Donax punctatostriatus* Hanley. Hypotype, left valve, from Loc. 4859 (C.A.S. H. Hemphill coll.), Magdalena Bay, Lower California. Length, 44.4 mm.; height, 28 mm. P. 255.
- Fig. 18. *Abra palmeri* Dall. View of the interior of the specimen shown in Fig. 16.
- Fig. 19. *Semele craneana* Hertlein & Strong, sp. nov. Holotype, left valve, dredged in the Gulf of California. (Exact station unknown but probably in the southern portion of the Gulf of California). Length, 38 mm.; height, 29.5 mm. View of the interior. P. 241.
- Fig. 20. *Abra palmeri* Dall. Hypotype, left valve, from Station 199-D-1, Lat. 13° 08' N., Long. 87° 43' W., Meanguera Island, Gulf of Fonseca, El Salvador, in 16 fathoms (29 meters). Length, 10.5 mm.; height, 9.3 mm. View of the interior. P. 250.
- Fig. 21. *Semele verrucosa* Mörch. Hypotype, right valve, from Station 224, Lat. 7° 23' 30" N., Long. 82° 03' W., Hannibal Bank, Panama, in 35-40 fathoms (64-73 meters). Length, 43 mm.; height, 32.8 mm. View of the interior. P. 249.
- Fig. 22. *Semele craneana* Hertlein & Strong, sp. nov. Holotype. View of the exterior of the specimen shown in Fig. 19.
- Fig. 23. *Abra palmeri* Dall. View of the exterior of the specimen shown in Fig. 20.
- Fig. 24. *Semele verrucosa* Mörch. View of the exterior of the specimen shown in Fig. 21.

All the specimens illustrated on this plate are in the type collection of the Department of Paleontology of the California Academy of Sciences.

